REDUCING DENTAL ANXIETY IN CHILDREN USING VIDEO SELF-MODELLING

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of

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Abbreviations

VSM:	Video Self-Modelling
CFSS-DS:	Children's Fear Survey Schedule – Dental Subscale
BAT:	Behavioural Avoidance Test
HR:	Heart Rate
CBT:	Cognitive Behavioural Therapy

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Abstract

This single case design study aimed to reduce dental anxiety in children using a point-of-view video self-modelling (VSM) intervention using a chroma-key technique. To meet criteria for inclusion two seven-year-old children were screened with the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS). Participants who met criteria completed a Behavioural Avoidance Test (BAT) and heart rate was measured. Participants viewed their VSM intervention four times over two weeks. The results showed that both participants' anxiety decreased on the CFSS-DS scale. The overall findings support the hypothesis that dental anxiety could be reduced using a VSM intervention. The results also suggest that dental anxiety was displayed differently in these two young children and individual needs should be addressed.

Chapter 1

INTRODUCTION

Anxiety is an emotion that most people experience in their lives. Anxiety experiences are not all the same for each individual and they can vary in intensity. For example, a child may feel anxious and experience a stomach-ache before visiting a dental clinic. Another child, in contrast, may become much more anxious before visiting a dental clinic and it can cause them to escape the situation and run away. Everyone responds differently and the severity of the anxious experience therefore determines whether the symptoms are categorised as anxiety or a phobia (Johren, Jackowski, Gangler, Sartory, & Thom, 2000).

Visiting the dentist is a yearly event for most children, and for some, the visit creates an intense anxious response and can be very distressing for them. Dentists try to comfort children during their appointment, however, targeted interventions may be of more assistance to the child. This study used video self-modelling as an intervention to help reduce dental anxiety in children. Video self-modelling (VSM) is a technique that involves a personalised video of an individual. The video depicts an individual performing an action or behaviour that they currently cannot do. This study investigated if video self-modelling as an intervention was effective at helping children reduce their dental anxiety.

This chapter will now discuss anxiety disorders and dental anxiety in more detail. Examples of other types of interventions used in this area of anxiety will be reviewed along with specific literature using modelling in the dental setting and then the current study will be described.

Part I: Phobia, Fear, and Anxiety

It is important to distinguish the difference between the terms anxiety, fear, and phobia as these terms are often used interchangeably. Armfield (2010) defines *anxiety* as a negative emotion felt when anticipating an unwanted situation, whereas *fear* is what a person feels when in the unwanted situation. The American Psychiatric Association (2013) defined *phobia* as a psychiatric disorder that requires a diagnosis by a health professional and involves a severe fear of a stimulus that interferes with everyday life and functioning.

Anxiety Disorders

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, 2013) categories phobias as a type of anxiety disorder. There are different types of phobias, including social phobia, agoraphobia, and specific phobia. Phobias tend to begin during childhood and progress into adulthood if left untreated.

Specific phobias. A specific phobia is when an individual experiences an intense and fearful response to one particular thing or situation (American Psychiatric Association, 2013). This response is considered excessive for the risks actually present. For example, a woman with a cockroach phobia was not able to take out her rubbish because of the fear of encountering a cockroach (Botella et al., 2011). This response is not shown in other areas of life so therefore this response is not related to general anxiety or shyness (Dowrick, 1986).

Specific phobias are divided into subtypes that include animal, situational, blood-injection-injury, natural environment and other situations (American Psychiatric Association, 2013). Dental phobia is under the specific phobia category as it relates only to dental stimuli. There is debate, however, if dental phobia should be classed as a

subtype of blood-injection-injury phobia or as a separate subtype (van Houtem et al., 2014). Van Houtem et al. (2014) argue that blood-injection-injury (B-I-I) phobia should be seen as a separate category from dental phobia. People who have B-I-I phobia tend to fear having an injection, the site of blood, medical procedures, or the risk of becoming injured (American Psychiatric Association, 2013). People with dental phobia can also fear those things, but the fear of specific dental situations is normally greater. For example, an individual with dental phobia normally fears the dental tools, such as the sight of the drill, more so than the site of blood (van Houtem et al., 2014). It can be difficult to decipher the difference between these phobias, as dental procedures can often involve blood and injections.

To investigate the difference between the two phobias, Van Houtem et al. (2014) surveyed 11,213 Dutch adults from twin families aged 18 to 100 years old. Of this group 61.2% were female. The researchers also investigated what individuals with dental phobia feared the most. The participants with dental phobia did not always fear blood, injections, or becoming injured, suggesting that dental phobia is a separate condition. The participants indicated they more often feared root canal treatment, having a tooth drilled, or having the local anaesthetic wear off while still undergoing treatment. From these findings, Van Houtem et al. (2014) suggest dental phobia should therefore be categorised in the *other* subtype. The *other* subtype includes situations when an individual can have more than one specific phobia (American Psychiatric Association, 2013). Someone therefore could have both B-I-I phobia and dental phobia. The first diagnosis would be a specific phobia of the B-I-I subtype and the second diagnosis would be specific phobia of the *other* subtype to account for the dental phobia.

Phobia treatments. There are a variety of treatments for children with phobias, including peer-modelling (Mungara et al., 2013), participant modelling (May, Rudy, Davis, & Matson, 2013), reinforced practice (Gillis, Natof, Lockshin, & Romanczyk, 2009), in-vivo exposure (Menzies & Clarke, 1993), systematic desensitisation (Newman & Adams, 2004) and cognitive-behavioural therapy (CBT) with one-session treatments (Ollendick et al., 2009). According to a review by Ollendick and King (1998) participant modelling and reinforced practice are considered well-established interventions for the treatment of phobias.

When discussing modelling, there are different types that should be distinguished. Peer-modelling is when a fearful child observes another child (similar to them) interacting with their feared stimulus (Dowrick, 2012). The peer-model remains calm around the feared stimulus and models the appropriate response behaviour to the fearful child. Participant modelling involves the above and then requires the fearful child to approach their feared stimulus or perform the behaviour that has just been modelled to them (May et al., 2013). Participant modelling may therefore be more effective than peer-modelling because it gives the fearful child the opportunity to practice the new behaviour and build their skills with their feared stimulus (May et al., 2013).

When implementing and evaluating any type of intervention, it is important to investigate if the children's fear could be a normal characteristic for their age (American Psychiatric Association, 2013). Sometimes the dental fear response in children can be seen as reasonable as the dentist can appear as a threatening stranger (Melamed, 1986). The severity of the fear is therefore important to measure. For example, children are often afraid of the dark, however this does not greatly impact on their general functioning and the children may grow out of the fear over time (American Psychiatric Association, 2013). The children's fear in this example is therefore not a phobia as they

can grow out of their fear and the severity is low. Dental anxiety is similar in this respect as it is not severe enough to be considered dental phobia. Minor dental anxiety can progress into dental phobia over time if the child develops a negative view of the dentist or has a negative experience (Melamed, 1986). It stands to reason, that children should be targeted early if any anxiety symptoms develop (Porritt, Marshman, & Rodd, 2012).

Part II: Dental Anxiety

Children with dental *anxiety* feel worried and uncomfortable when expecting to visit the dentist (Porritt et al., 2012). They can have an emotional response to dental situations or stimuli. Dental *fear* refers to the behaviours and emotions the children display when in the dental situation (Porritt et al., 2012). Behaviours include, avoidance of the dentist, crying, screaming, fidgeting, getting out of the chair, refusing to leave parent/guardian and refusing to open their mouth (Aartman, van Everdingen, Hoogstraten, & Schuurs, 1996). Some children with dental anxiety are less reactive in their response even though their anxiety is still high (Melamed, 1986). Their behaviours can include clenching fists, closing eyes and fainting (Mungara et al., 2013). Dental anxiety more commonly emerges in childhood compared to older age groups, however, adolescent or adult age of onset is still possible (Locker, Liddell, Dempster, & Shapiro, 1999). There are a number of possible causes of dental anxiety in children. These causes are discussed below.

Cause of dental anxiety. Causes of dental anxiety include, conditioning, judgement from dentists, and modelling. Classical conditioning (also known as respondent conditioning) is a common cause of dental anxiety (De Jongh, Muris, ter Horst, & Duyx, 1995). Fear acquisition through classical conditioning occurs when an individual is in a specific environment and something occurs that evokes anxiety

(Wolpe, 1982). If the individual focuses on a specific stimulus in that environment, the feeling of anxiety and the stimulus can become paired (Wolpe, 1982). Therefore, in the future, when the individual sees the stimulus the anxious feeling develops because of the previous association. In dentistry, classical conditioning occurs when the dental stimuli are paired with a negative experience that evoked anxiety (Locker et al., 1999). If something frightening happened at the dentist, a child will be more likely to feel anxious and afraid in the next visit because they associate the dentist with the fear they previously experienced (Levitt, McGoldrick & Evans, 2000). Classical conditioning is an automatic response and the individual does not consciously make the decision to become afraid of dental stimuli (Wolpe, 1982). It is also important to note that not all individuals become classically conditioned when under stressful situations, this is because some individuals are more sensitive than others and they will react differently to the same situation (Wolpe, 1982). Miller, Roussi, Caputo, and Kruus (1995) state that some individuals are more vigilant to sensory information than others and are therefore more affected by stressful dental situations. One possible cause of dental anxiety could therefore be related to negative experiences and the conditioning effects associated. The development of the dental anxiety could also be dependent on individual differences.

De Jongh et al. (1995) surveyed 224 psychology undergraduate students about their dental anxiety. One hundred and eighteen participants reported having dental anxiety at some point in their life with this anxiety still affecting 73 participants at the time of the study. A significant correlation was found between negative dental experiences and dental anxiety. Participants were more likely to have dental anxiety if they had experienced dental treatment that was painful or traumatic. For 28 participants, the dental anxiety was not present until they experienced their first painful event at the dentist at the mean age of 13 years old. These results suggest that negative dental

experiences can condition individuals to anxiety, meaning that later visits to the dentist elicits the same anxious response that was present during the initial painful or traumatic dental experience (Porritt et al., 2012).

Some individuals are not only sensitive to the dentist's actions but also to the attitude of the dentist (Gale, 1972). If a dentist has a negative attitude and is judgemental towards the patient, this could also impact on the patient's feelings about visiting the dentist again and can cause dental anxiety. Gale (1972) indicated that "hearing you have bad teeth from the dentist" was rated as number three (p. 965) in the top 25 most fearful aspects of visiting the dentist. This finding was replicated by Stouthard and Hoogstraten (1987) as they found participants rated this aspect as the second most fearful situation out of 12 different dental situations. This possible cause of dental anxiety only involves the issue of judgement and is not related to pain associated with dental work. Whether this is further related to the anticipation of painful dental work is unknown.

Dental anxiety could become dental phobia if severe enough and acquisition is relatively similar for anxiety and phobia (De Jongh et al., 1995; Ost, 1987). Ost (1987) conducted a retrospective study with 370 participants with dental phobia to determine what caused the development of the anxiety. The age of the participants ranged from 15 to 68 years of age. From the survey results, 68% of the participants reported that conditioning was the cause of their phobia while 13% reported modelling as the cause. A smaller number of participants reported instruction from adults created the phobia and some participants could not remember the cause. The average age of onset for dental phobia was approximately 12 years old with the mean duration of the phobia found to last 23 years.

Besides conditioning, modelling was the next commonly reported cause of dental anxiety. Parents are often the model for their child and any anxious responses from the parent could teach the children to duplicate their behaviour (Ost, 1987). If a parent has dental anxiety and their child observes their reaction to the dentist, this could communicate to the child that the dentist is something to fear. Parents may also display anxious behaviour while their child is undergoing a dental appointment (Porritt et al., 2012). Since children often look at their parent's reaction to guide their own response, a parent's anxious response could communicate to the child that they are not safe (Porritt et al., 2012). The child therefore may become anxious themselves.

As mentioned above, not all individuals who have a negative experience at the dentist develop dental anxiety. Davey (1989) proposed that individuals are less likely to develop dental anxiety if they have had several encouraging experiences before a painful or traumatic experience. He called this latent inhibition. Davey (1989) tested this hypothesis by surveying a group of 101 university students in England. He found that individuals who reported having a negative dental experience later in life were less likely to develop dental anxiety, whereas individuals who had a negative dental experience earlier in life were more likely to develop anxiety. This finding suggests that individuals who had a painful or traumatic experience later in life were more likely to have had previous experiences at the dentist that did not cause pain or distress. When the painful or traumatic event did occur, these individuals did not learn to fear the dentist because they had already created a view of the dentist earlier in life that did not involve fear. One negative experience was therefore not able to change their view of the dentist. Those individuals who had negative experiences earlier in life were not able to develop a positive view of the dentist in their life before their negative incident occurred and therefore dental anxiety had a higher chance of developing.

Dowrick (1986) argues that discovering the origin of the fear is not as important as determining what maintains the fear for the child. For those who have acquired dental anxiety, negative thought processes could be reinforcing the fear. The term *catastrophising* refers to a way of thinking where the worst possible scenario is thought of in every situation (De Jongh, Muris, ter Horst, Van Zuuren, & De Wit, 1994). Catastrophising often occurs with people who have dental anxiety because they think a painful experience is going to happen every time they visit the dentist. De Jongh et al. (1995) found a positive correlation between individuals with dental anxiety and negative cognitions about dental treatment, suggesting that people who have dental anxiety are more likely to think negative thoughts about dentistry. Individuals with dental anxiety were reported to focus more on the dental treatment and their teeth while at the dentist than non-anxious individuals. Dental patients can also worry about the instruments, bleeding, not having full control, death and the unknown (Anderson & Masur, 1983). These thoughts can increase their fear when at the dentist or it can prevent them from going to the dentist completely (Armfield, 2010).

Gender differences in dental anxiety. Specific phobias are more common in females than males (American Psychiatric Association, 2013). Similarly, studies have found that dental anxiety is more common among females than in males (Ter Horst & De Wit, 1993; Raadal, Milgrom, Weinstein, Mancl, & Cauce, 1995). A study based in Washington, USA reported that out of 421 children, 25% of females compared with 16% of males had high dental fear (Baier, Milgrom, Russell, Mancl, & Yoshida, 2004). Liddell and Locker (1997) investigated the gender difference in dental anxiety further and found that females tend to have higher anxiety about experiencing pain than males. It was also found that females felt they had less control during dental treatment and reported their ability to cope with dental treatment as lower than males. From these

findings, it appears that males and females have differences in their cognitions about dentistry and this could be contributing to the gender difference in prevalence.

Differences in response to intervention. Melamed, Yurchseson, Fleece, Hutcherson and Hawes (1978) found an interesting interaction effect between age of participant and the effectiveness of intervention. Eighty children from the USA aged between 4 and 11 years were selected from a pedodontic clinic to undergo an intervention. Participants were then assigned to five different groups before attending a dental appointment. Depending on the assigned group, the children were asked to watch a specific video before their dental appointment. Group 1 viewed a 10-minute video (long version) of a child model undergoing dental treatment. Group 2 viewed a 10-minute video (long version) of a demonstration with the dentist but with no child model. Group 3 viewed the short version of the child model and Group 4 viewed the short version of the demonstration video. Group 5 was the control group that watched an unrelated film. The results showed that the effectiveness of the video depended on the age of the child. Younger children between the ages of four and six years had lower self-reported fear after they viewed the longer version of the demonstration video, whereas the older children between the ages of 8 and 11 years had lower fear levels after they viewed the peer-model video. Younger children therefore may require more information about the dental procedure since they responded best to the longer demonstration video. Older children may therefore need confirmation from watching a peer since they responded best to the peer-model video. For this reason, different age groups within a study may need to be identified before evaluating the effectiveness of an intervention as results can vary between age groups. Anderson and Masur (1983) stated that some studies have not separated age groups and their results may therefore be skewed and should be interpreted with caution.

Importance of Providing Information

When a child has to undergo a medical or dental procedure, health professionals often try to inform the child and their families about the procedure as best they can. What can happen, however, is that the health professionals do not provide the information in a sensitive way that is age appropriate, leading the child to feel anxious or uncertain (Jaaniste, Hayes, & von Baeyer, 2007). This finding suggests that taking more care and taking time to inform children and families about medical or dental procedures beforehand may help to decrease anxiety about the procedure. If information is not communicated effectively this could increase the risk of children developing dental or similar forms of anxiety.

Jaaniste et al. (2007) outline two reasons why correct preparatory information could help children (and their families) reduce anxiety. First, if appropriate information is provided this could help to correct unrealistic expectations that children often have about visiting health professionals. Children can catastrophise about visiting the doctor or dentist and can believe a simple procedure to be life threatening or extremely painful when it is not. It would therefore be important to restructure this view before the procedure. Second, the information can help to relieve children of distress because they will know what is going to happen. The fear of the unknown is often at the core of medical or dental anxiety and outlining exactly what the child will go through can help them psychologically prepare themselves for the procedure (Anderson & Masur, 1983). Dental anxiety is also related to feeling out of control when in a dental situation (Schuurs & Hoogstraten, 1993). Providing the child with preparatory information further helps to decrease these feelings if they understand the situation.

The way in which the information is presented is also very important as this can influence its effectiveness. Jaaniste et al. (2007) state that this information needs to be

very clear, engaging, specific, as well as age appropriate so the children can understand what will happen. An outline of what will happen in the procedure should be paired with what the children will experience through their senses (Anderson & Masur, 1983). For example, for a dental procedure the children would need to be told the dentist will use a drill on their teeth and also that the drill will cause a vibration sensation in their jaw and this may cause discomfort.

This type of preparatory information was used in a study by Siegel and Peterson (1980). This study is discussed in detail in Part III: Types of Intervention for Children with Dental Anxiety. The researchers divided 42 preschool aged children into three groups: sensory information group, coping strategies groups and a control group. Both experimental groups coped well in their dental appointments. Siegel and Peterson (1980) concluded that dental anxiety is a disorder that if left unaddressed may develop into further psychological and physical issues. Health care professionals should therefore benefit from giving children all the information they need so that they can understand what happens in a dental appointment and teach them strategies to help cope with their emotional responses.

Importance of Reducing Dental Anxiety

When children have a high level of dental anxiety, this not only upsets the child and their family/whanau, but as Al-Namankany, de Souza and Ashley (2012) point out, this anxiety/fear can also make the dental therapist's job extremely difficult for three main reasons. First, at the clinic, the child could become injured if they hit the dentist when the dentist is using a needle or drill. It would be extremely easy for the dentist to be hit or bumped when drilling since the child's hands are very close to the dentist. Second, it takes longer to perform treatment on an anxious child compared to a non-anxious child because anxious children often interrupt the procedure. An anxious child

may require several appointments to complete treatment compared to a non-anxious child who may only require one appointment. Third, some dentists refuse to work with children who respond to treatment with disruptive behaviour so the dentist then has to refer the anxious child to a specialist. Some paediatric specialists may require the child to be put to sleep with general anaesthetic which can then increase the cost of treatment (Backman & Pilebro, 1999). Consequently, children with dental anxiety can be a high risk for dentists to treat, the children's treatment appointments can be time consuming, and the children can also be expensive to treat.

The child's anxiety also puts them at risk because if they avoid visiting the dentist their oral health can deteriorate. Untreated dental issues can lead to large infections, extreme pain and loss of teeth. It is best for a person's well-being and health (and their financial situation) to have regular dental check-ups. The issue, however, is that those who are anxious/fearful of the dentist do not visit the dentist until they absolutely have to and this could be too late for restorative treatment, thus making visits prolonged and uncomfortable (Armfield, 2010). In addition, if dental hygiene is not maintained into adulthood, the costs of dental treatment can be extensive and be more expensive than the cost of a regular check-up once a year. Armfield (2010) further proposed that dental anxiety may be a part of a vicious cycle; those who are afraid of the dentist tend to avoid it, however, the avoidance decreases oral health and increases the chances of dental problems. If the fearful/anxious person does receive dental treatment, this could increase or reinforce their fear because the dentist has become associated with uncomfortable, lengthy and expensive procedures, instead of short, non-expensive routine check-ups. This can be a serious issue for children because their permanent teeth are emerging and these teeth stay with them for life. If permanent teeth are neglected at

a young age, the child will not have strong healthy teeth as an adult (Jalevik & Klingberg, 2002).

If a child with dental anxiety does not receive help, the anxiety can progress into adulthood and continue to impact on their life. Cohen, Fiske, and Newton (2000) stated that adults with dental anxiety reported feeling misunderstood and stigmatised for their anxiety as well as reporting low self-esteem and low self-control. Some adults also reported having vivid memories of traumatic dental experiences years later. To prevent these types of problems, some scholars suggest that health and dental education should be integrated into the school curriculum, the school environment and the wider community (St Leger, 1999). This type of education teaches children the benefits of taking care of themselves and can improve their health outcomes in the future (St Leger, 1999). A focus on prevention of dental anxiety can therefore make a difference for children (Klorman, Hilpert, Michael, LaGana, & Sveen, 1980). When dental anxiety does develop in children, there are interventions aimed at reducing this to avoid the progression of the anxiety into adulthood. These interventions are discussed below.

Part III: Types of Interventions for Children with Dental Anxiety

Search strategy. The PsycInfo Database and Google Scholar were used to search for relevant articles on the types of interventions used for children with dental anxiety. Key terms used in the search were, “child dental anxiety”, “child dental phobia”, “dental and modelling”, “treating child dental”. Citations within the articles found were reviewed and relevant articles selected. Several review articles were found and provided details of more relevant articles. The studies included in this literature review had to contain child participants aged 12 years and under. Those studies with adolescent or adult participants were excluded. The sourced studies had to investigate the effectiveness of an intervention for children with dental anxiety.

The literature indicated a small body of evidence-based studies addressing children's anxiety/fear with dental visits. Of the 23 articles found, several different types of interventions have been used for young children with dental anxiety including medications (Shapira, Holan, Guelmann, & Cahan, 1992; Shapira, Kupietzky, Kadari, Fuks, & Holan, 2004), distractions (Aitken, Wilson, Coury, & Moursi, 2002; Naithani & Viswanath, 2014), cognitive behavioural therapy (Siegel & Peterson, 1980), systematic desensitisation (Luscre & Center, 1996; Machen & Johnson, 1974), procedural information (Siegel & Peterson, 1980), and modelling (Al-Namankany, Petrie, & Ashley, 2014a; Al-Namankany, Petrie, & Ashley, 2014b; Melamed, Hawes, Heiby, & Glick, 1975a; Melamed, Weinstein, Hawes, & Katin-Borland, 1975b; Melamed et al., 1978; Mungara et al., 2013). These studies are summarised in Table 1 and critiqued below. Modelling interventions will be reviewed and critiqued separately and are summarised in Table 2.

Table 1
Interventions for Children Aged 12 Years and Under with Dental Anxiety

Author	Design/Participants	Intervention	Measures	Results
Aitken et al. (2002)	Between groups design. Forty-five children aged 4-6 years	Group 1: Upbeat music distraction Group 2: Relaxing music distraction Group 3: No music (control group)	1. Parent-report via Modified Corah Anxiety Scale 2. Self-report via Venham Picture Scale 3. Heart rate 4. The North Carolina Behaviour Rating Scale 5. Visual analogue scale for pain	There were no significant differences between groups
Corah (1973)	Between groups design. Twenty-four children aged 6-11 years	Group 1: Signalling device for sense of control Group 2: Control group	1. Galvanic skin response 2. Head and body movements recorded by Fehr method 3. Behaviour and cooperation ratings determined by dental assistant observers	No difference between groups on head movements or behaviour ratings. Galvanic skin response ratings (GSR) differed. Group 1: 17 GSR per minute during an injection. Group 2: 23 GSR per minute during an injection
Dowrick (1986)	Within subjects design. 5-year-old child with congenital birth defect	VSM combined with systematic desensitisation	1. Coping skills during a dental appointment	Within six weeks, the child was able to complete a visit to the dentist with minimal fear, as rated by an observer. This behaviour was maintained after a 12 month follow up.

Fox and Newton (2005)	Between groups design. Thirty-eight children aged 5-17 years	Group 1: Positive images of dentistry Group 2: Neutral images of dentistry	1.Anticipatory dental anxiety levels measured by the Venham Picture Test	Group 1 scored a mean of .21 out of 8 on the Venham Picture Test. This was less anticipatory anxiety than Group 2, who scored a mean of 3.31.
Haim Sarnat and Hanauer (2001)	Within subjects design. Twenty-four participants aged 3-12 years	Communication techniques delivered by the dentist to all children. Permissive, empathic, and personal approaches were used	1. Frequency of the type of language used by the dentist 2. Child self-reported anxiety from analogue anxiety scale 3. Frankl's cooperation scale 4. Success of treatment as rated by dentist 5. Final mood rated by observer	Frequency of use: permissive approach = 26 times per session; empathic approach = 4 times per session; personal approach = 12 times per session. Empathic approach was significantly related to treatment success with a correlation of .75
Howard and Freeman (2009)	Between groups design. 74 children aged 5-10 years	Group 1: Use of puppet to re-enact previous dental experience Group 2: Control group	1. Faces version of the Modified Child Dental Anxiety Scale	No significant differences were found between groups over the course of the intervention. The puppet did not reduce children's dental anxiety
Levitt et al. (2000)	Case study, 12 year old boy	CBT with muscle relaxation, breathing, graded exposure, and realistic thinking. Nitrous Oxide was also given as needed	1. Self-reported anxiety measured with Corah Dental Anxiety Scale (CDAS) 2. Visual Analogue Scale (VAS)	The boy was able to use the coping techniques when distressed and only required nitrous oxide for the injection in his last appointment. CDAS pre treatment = 17, post treatment = 9. VAS pre treatment = 9.6, post treatment = 6.6

Luscre and Center (1996)	Multiple baseline across participants. Three male participants with autism spectrum disorder aged 6-9 years	Systematic desensitisation, peer-modelling and reinforcement combined	1. Number of steps completed from a dental task hierarchy created by the researchers (13 tasks in total). Number of steps completed were recorded in an analogue setting and then an in-vivo setting	Post intervention, more steps were completed in the final treatment sessions than in baseline sessions. Participant 1: baseline tasks = 5, in-vivo tasks = 13; Participant 2: baseline tasks = 4, in-vivo tasks = 12; Participant 3: baseline tasks = 5, in-vivo tasks = 11
Machen and Johnson (1974)	Between groups design with 31 preschool aged children who were randomly assigned to groups	Group 1: Desensitisation Group 2: Video Peer-Modelling Group 3: Control group	1. Behaviour rating scale adapted from Frankl, Shiere, and Fogels (1962). A score of 24 meant perfect behaviour	Both experimental groups had fewer negative behaviours than the control group during a treatment dental appointment. On the final session, Group 1 and 2: mean score of 20 out of 24; Group 3: mean of 15 out of 24
Naithani and Viswanath (2014)	Between groups design with children between 4 and 8 years	Group 1: Audio distraction (nursery rhymes) Group 2: Audio-visual distraction (cartoons). Group 3: No distractions (control group)	1. Venham Picture Test 2. Venham ratings of clinical anxiety 3. Child Fear Survey Schedule – Dental Subscale (CFSS-DS). Scores range from 15 – 75 and the lower the score the less anxiety. 4. Pulse rate and oxygen saturation	Audio-visual distraction was more effective than audio distraction alone. Audio distraction was more effective than receiving no distractions. In the final treatment appointment, Group 1: 19.76 on CFSS-DS; Group 2: 18.32; Group 3: 22.28

Shapira et al. (1992)	Within groups design with 19 preschool aged children. Children were classed as difficult/anxious patients	Session 1: Nitrous oxide Session 2: Hydroxyzine Session 3: Combination of both	1. Behaviour rating scale for crying and alertness 2. Scale for general behaviour	Session 3 had less crying during dental visits (M=3.73) compared to Session 2 (M=3.19) and Session 1 (M=3.30). The best possible score was 4
Shapira et al. (2004)	Between groups design with 28 preschool aged children. Children were classed as difficult/anxious patients	Group 1: Midazolam Group 2: Midazolam combined with hydroxyzine	1. Behaviour rating scale for sleep, quietness, crying, and body movements (Modified Ohio State University Behaviour Rating Scale) 2. A general behaviour scale similar to Houpt's overall behaviour scale	Midazolam and hydroxyzine when combined was most effective at sedating the children than midazolam alone. There was less crying and less movement in Group 2 compared to Group 1. At the 30-minute mark after sedation, Groups 1: 47% of children were crying; Group 2 32% of children were crying
Siegel and Peterson (1980)	Between groups design with 42 preschool aged children	Group 1: Self-control coping skills (CBT) Group 2: Sensory and procedural information Group 3: Control	1. Behaviour Profile Rating Scale 2. Venham Picture Test 3. Pulse rate	Group 1: $t(26) = 6.74$, $p < .001$ Group 2: $t(26) = 7.03$, $p < .001$. This indicated both experimental groups had fewer disruptive behaviours than the control. The control was rated as less cooperative and more anxious by the observers. No difference was found between experimental groups

Venham et al. (1981)	Between groups design with 55 children aged 2-6 years	Group 1: Audio-visual distraction (children's television show) Groups 2: No distraction	1. Self-report anxiety scale called Venham Picture Selection Task 2. Clinical behavioural ratings 3. Heart rate	No significant differences found between groups

Dental anxiety and medication studies. Medication is commonly used in paediatric dentistry. Medications such as hydroxyzine, midazolam, and nitrous oxide have been used with children when their behaviour becomes too difficult for the dentist to manage (Shapira et al., 1992; Shapira et al., 2004). Hydroxyzine is an antihistamine that causes drowsiness and is often used in paediatric dentistry. Midazolam is a benzodiazepine sedative hypnotic that works as a muscle-relaxant and can also have an amnesic effect. When using these medications, the children are given the required dose around 20 to 30 minutes before their appointment and this is supposed to relax them and make them sleepy (Shapira et al., 2004). Medications are supposed to reduce children's crying, talking, and other behaviour considered disruptive, and increase drowsiness and sleep during the dental appointment (Shapira et al., 1992). This allows the dentist to perform treatment with fewer disruptions and get through the work faster.

Shapira et al. (1992) found that hydroxyzine was most effective when it was combined with nitrous oxide compared to either drug used alone. In a within groups design, 19 preschool aged children underwent three dental appointments each. In each dental appointment, a different combination of medication was given to each child to see if differences in behaviour occurred depending on the medication given. The combinations included hydroxyzine alone, nitrous oxide alone, and then both hydroxyzine and nitrous oxide together. The order of medication given to the children for their dental appointments was randomised. The children's behaviour was rated

during each dental appointment with crying and alertness as the target behaviours. A general behaviour score was also rated to give an overall rating for the appointment for the child. Of the 57 sessions in total, 89% of all sessions regardless of the medication given were rated as successful, meaning children's behaviour in 51 sessions was scored as either, good, very good, or excellent. However, when hydroxyzine and nitrous oxide were used together, 79% of 56 sessions were successful. When hydroxyzine was used alone, or when nitrous oxide was used alone, approximately 50% of sessions were successful. The researchers concluded that hydroxyzine and nitrous oxide were most effective when used together as children were less responsive during the appointment.

These results suggest that medication can assist a dentist to perform dental treatment more easily, however, the medication does not help the child address their anxiety. The child's disruptive behaviour is occurring for a reason and it is often because they are frightened of the situation. Providing children with medication only masks the problem in the short term, with the future likelihood of the child requiring medication before every dental procedure so that they can reach the desired level of relaxation for treatment to occur (Shapira et al., 2004). This situation may not always be possible or acceptable to the parents/guardians. Another issue when using medications is that it may require the child to not eat or drink anything hours before a dental appointment. A study by Shapira et al. (2004) required their child participants not to eat at least 4 hours, and to not drink anything 2 hours before treatment. This may cause discomfort to children and may require parents to monitor their children more closely before the appointment. A different way of assisting children through their dental anxiety at appointments is to distract them from the stimuli of the dental tools.

Distraction. Distractions provide a way for dentists to occupy their dental patients that experience anxiety. Venham et al. (1981) conducted a study to test

distraction as an intervention and found audio-visual distraction in the form of cartoons made no difference to the children's anxiety in the dental appointment when compared to the control group. Naithani and Viswanath (2014) then conducted a similar study to further investigate the use of audio and audio-visual distractions to help reduce children's dental anxiety. They used the Venham's Picture Test and the CFSS-DS as their child self-report measure. The parent-report version of CFSS-DS was also used. A behavioural measure, the Venham's Rating of Clinical Anxiety, and a pulse oximeter were used to measure the child participants. Seventy-five children aged four to eight years old were separated into three groups. Group 1 received audio distraction (nursery rhymes), group 2 received audio-visual distraction (cartoons) and group 3 received no distractions during their dental visits. The children attended four dental appointments and their pulse was measured during each visit. Significant differences in pulse rate were found between the four groups, with the group who received audio-visual distractions having the lowest pulse rate during appointments, compared to the groups who received just audio distraction or no form of distraction. Researchers found audio-visual distraction was more effective than audio distraction alone and audio distraction was still more effective than receiving no distractions. This last finding was contradicted by a study conducted by Aitken et al. (2002).

Aitken et al. (2002) provided musical distractions or no distraction to children during their dental appointments and measured their anxiety, behaviour and pain. The musical distractions did not improve the children's anxiety, behaviour, or pain level and the experimental groups were equal to the control group which received no form of distraction. One difference between the Aitken et al. (2002) and the Naithani and Viswanath (2014) studies was that Naithani and Viswanath provided nursery rhymes to the children as the audio distraction whereas Aitken et al. (2002) provided upbeat or

relaxing music. Children may have found the nursery rhymes more familiar and interesting compared to the music and it therefore may have been more effective at distracting the children and thus reducing their anxiety.

Distraction as a technique for children may improve their anxiety in the dental appointment in some cases, however, it fails to improve their understanding of the procedure and it fails to teach them to manage their anxiety. Other dentists may not always have distraction equipment available for children. If some dental clinics do provide this and use it often this could be problematic as both the dentist and child could become reliant on it. The children's dental anxiety could therefore still be present as this technique does not resolve their feelings, it only manages it in the short-term. There are other techniques that aim to help children overcome their dental anxiety for the long term, including behavioural interventions.

Systematic desensitisation. One form of behavioural intervention is called systematic desensitisation. Wolpe (1982) explains that in this intervention an individual is taught to relax their body and muscles before being exposed to an anxiety-provoking stimulus. The first stimulus presented is in the form of an imaginary situation and can be slightly frightening to the individual. Repeated exposure to this stimulus eventually minimises the anxious response as the individual learns to cope. The stimuli are presented in sequential steps and they become progressively more anxiety-provoking in each step. The deep muscle relaxation is able to counteract the individual's anxious response.

Machen and Johnson (1974) compared systematic desensitisation with modelling learning therapy to examine which was more effective at preparing children for their dental appointments. Thirty-one preschool aged children participated in this study. They were randomly split into three groups, desensitisation, modelling learning, and control

groups. These children had no previous experience with dental visits. A behaviour rating scale adapted from Frankl et al. (1962) was used by two independent observers who observed the children at their dental appointments through a one-way mirror. The children in the experimental groups received their intervention one week before the first dental appointment. The control group were not seen before their first appointment.

The desensitisation intervention required the children to view anxiety-provoking dental stimuli. The children were shown these items gradually, starting with the least frightening items. The children were shown a new item only when they were able to relax in the presence of the previous item. The first few items shown to the children were teeth cleaning material, a dental mirror, a sharp pen-shaped tool called an explorer, and a small plastic square item called a rubber dam (used to hold the child's mouth open). More frightening stimuli shown towards the end were the anaesthetic syringe and the drill. In contrast, the children in the modelling group viewed an 11-minute video of another child undergoing a dental appointment. The child displayed positive behaviour in the video and they were verbally reinforced by the dentist for compliant behaviour.

The first appointment for the participants involved an oral examination, whereas in the second and third appointment the children had a filling placed. On the first visit, the behaviour of each group was not significantly different from each other. During the treatment appointments, both experimental groups had significantly fewer negative behaviours than the control group. The results of the two experimental groups did not differ from each other, as both desensitisation and modelling were effective at reducing negative behaviour in the dental treatment appointments. This means that the children in this study benefited both from seeing another child go through a dental appointment as well as seeing dental stimuli in a controlled environment. The study discussed next used both these interventions together.

Luscre and Center (1996) used a combination of desensitisation, modelling, and reinforcement for an intervention with three boys with autism. The boys were aged six to nine years old. A hierarchy of steps was created that outlined the procedures of a dental examination. The aim was to increase the number of steps completed for each participant and for them to be able to sit through the dental examination. The children were measured in a pretend dental environment created by the researchers (analogue environment). Once the steps were mastered, the children were measured in a real dental clinic (in-vivo environment). In the analogue setting, the children were shown a video of another child undergoing the dental steps they needed to model. The dentist then showed the children the tools about to be used and the children had to agree to continue with the dental examination. If they agreed, positive reinforcement was given. If they disagreed that step was marked incomplete.

Desensitisation to dental stimuli therefore occurred during the modelling videos and during the presentation of dental tools. Guided mastery was applied where the children had to achieve a step in the analogue setting before moving on to the in-vivo setting. Individual reinforcers were decided for each participant in advance and were given directly after completion of a task. The results indicated that this intervention technique helped the participants increase the amount of steps completed. The number of steps completed gradually increased as the intervention sessions progressed and the difference between baseline and final measures was clinically significant. For example, participant 1 completed five baseline tasks and then 13 in-vivo tasks in the final measure. Participant 2 completed four baseline tasks and then 12 in-vivo tasks. Participant 3 completed five baseline tasks and then 11 in-vivo tasks. This study showed that the behaviours in the analogue setting were able to be generalised to the actual

dental clinic indicating that preparation of the dental procedure was effective in reducing anxiety in these three boys with autism.

The researchers did not investigate whether this technique could help the children through a treatment appointment as only dental examinations were performed. Dental treatment often elicits more anxiety in children because of the injection, use of drills and the unfamiliar environment; especially with children with autism. Since the types of interventions used in this study were not investigated separately, it was difficult to determine which intervention was most effective or if it was the combination of desensitisation, modelling and reinforcement techniques that enabled the reduction in anxiety. Further research would need to investigate which of the three interventions is most effective or whether using them in combination is more effective.

Procedural information and cognitive behaviour therapy. As mentioned above, procedural information as an intervention helps children to understand the procedure they are about to go through (Jaaniste et al., 2007). Cognitive behavioural therapy (CBT) by contrast attempts to change children's negative thought processes in order to change their behaviour. CBT teaches children positive self-statements and relaxation techniques which help change their thought processes (Ollendick & King, 1998). Children with dental anxiety often have negative cognitions about the dentist and it is these which are targeted in CBT interventions.

Siegel and Peterson (1980) compared procedural information with CBT as both are interventions for children with dental anxiety. The 42 preschool children involved in the study were matched and randomly assigned to three groups. One group was provided dental-specific sensory information as preparation for a dental visit and the second group was taught coping skills through CBT. A control condition with experimental contact only was also included as the third group. For each group the

intervention was given 30 minutes before the dental procedure. For group one, the sensory information included a full description of the planned procedure as well as the sensory experiences they were likely to experience during their appointment. A tape recording of what the drill sounded like was also played. The CBT group was taught to calm themselves down by repeating, "everything is going to be all right" (p. 786). The researchers also taught the children to use relaxation techniques such as breathing and pleasant imagery. The control condition children were read a Winnie the Pooh story by a researcher. Physiological, behavioural and self-report measures were taken to measure treatment effects.

Both experimental groups had fewer disruptive behaviours in their dental visit than the control group. The control group was rated as less cooperative and more anxious during the dental procedure and were more reactive to the local anaesthetic injection. Pulse rate was lower at post-treatment for the children who had either of the interventions. The only difference between the two experimental conditions was that the CBT group had a lower pulse rate before treatment compared to the sensory group so the findings on pulse rate are inconclusive. These results suggest that preparatory information such as these two interventions can reduce children's anxiety levels when undergoing dental treatments. It is interesting to note that young children are often not given CBT interventions because researchers feel it is beyond their cognitive capacity. These results indicated, however, that disruptive behaviours, anxiety levels, and heart rate were all lower in both intervention groups compared to the control group. The children appeared to benefit from both interventions and understood its components. No follow-up data was taken so it is unknown whether the intervention effects were maintained over time.

Levitt et al. (2000) also used CBT but with a 12-year-old boy with severe dental phobia. The boy described his dental fear as mostly consisting of fear of suffocating, anxiety the day before his appointment, and fear of the needle and drill. The researchers used two measures, the CDAS and the VAS. This case study taught the boy CBT techniques such as muscle relaxation and relaxation breathing. The researchers used graded exposure and practice sessions to help reduce the fear of specific stimuli. For example, the boy became severely anxious when introduced to the mask for nitrous oxide. The researchers had the boy explain what was causing his distress and to describe what he was imagining. His response was that he feared the mask because of its restricting nature and he was frightened he would suffocate from the gas. The intervention used cognitive restructuring techniques by asking the boy to focus on what was actually happening and not what could happen. The boy was told to imagine positive scenes of him successfully wearing the mask. To increase his confidence, practice sessions were then arranged for him to wear the mask at home. It is important to note that nitrous oxide for sedation was also used in conjunction with the CBT techniques. In this manner, the boy was able to learn how to cope with his anxious responses and build his confidence when undergoing the dental treatment. The boy maintained this improvement in one session when sedation was not available and he had to rely solely on his CBT techniques. In his final appointment he required sedation only for the injection and then was able to continue without it. His final CDAS score was 9 out of 20 and VAS score of 6.6 indicating a decrease in anxiety from his initial scores of 17 for the CDAS and 9.6 for the VAS. His final fear hierarchy identified four items compared to his initial hierarchy of 10 items. These findings indicate that the above techniques decreased the boy's fear to certain dental items.

From the literature reviewed above, there are several different interventions available for children with dental anxiety. Issues are still present such as cost of receiving psychological help, the time needed for the intervention, and the cognitive effort required from the child to change their thought processes and thus reduce their anxiety of dental visits. The following section describes modelling interventions which may be a simpler and more child-friendly type of intervention for dental anxiety in children.

Modelling Interventions

Table 2
Modelling Interventions for Children Aged 12 Years and Under with Dental Anxiety

Author	Participants/Design	Intervention	Measure	Results
Al-Namankany et al. (2014a)	Between groups design with 80 children aged 8-16 years	Group 1: Video modelling Group 2: Control	1. Abeer Children Dental Anxiety Scale (ACDAS). The ACDAS was completed pre-post intervention. 2. VAS	Group 1 had significantly lower dental anxiety after the video modelling intervention than the control during the dental procedure. Group 1: mean difference of 9.83 points on the ACDAS; Group 2: mean difference of .26 points on ACDAS. Group 1: VAS scores ranged from 4.34 – 31.91; Group 2: VAS scores ranged from 15.07 – 63.5
Al-Namankany et al. (2014b)	Between groups design with 180 children aged 6-12 years	Group 1: Video modelling Group 2: Control	1. ACDAS The ACDAS was completed pre-post intervention. 2. VAS	Group 1 had significantly lower dental anxiety after the video modelling intervention than the control during the dental procedure. Group 1: mean difference of 9.37 points on ACDAS; Group 2: mean difference of -.66 points on ACDAS; Group 1: VAS scores ranged from 7.05 – 36.53; Group 2: VAS scores ranged from 15.97 – 95.28

Klorman et al. (1980)	Between groups design with 60 children aged 7-8 years	Group 1: Coping peer-model Group 2: Mastery peer-model Group 3: Control	1. Behaviour Profile Rating Scale 2. Dentist ratings 3. Interview	There were no significant differences between groups, however, the coping group had fewer disruptive behaviours than the mastery and control group
Melamed et al. (1975a)	Between groups design with 16 children aged 5-11 years	Group 1: Video peer-modelling Group 2: Unrelated video as control	1. Child Fear Survey Schedule (CFSS) 2. Palmar Sweat Index (PSI) 3. Behaviour Profile Rating Scale (BPRS)	BPRS scores indicated Group 1 had fewer disruptive behaviours during a dental appointment. Group 1: $M = 2.67$ on BPRS; Group 2: $M = 5.59$ on BPRS. No significant differences were found between groups on CFSS and PSI
Melamed et al. (1975b)	Between groups design with 14 children aged 5-9 years	Group 1: Video peer-modelling Group 2: Drawing task	1. Maternal anxiety questionnaire 2. CFSS 3. Dentist observations 4. BPRS	Group 1 had fewer anxious behaviours compared to Group 2 during the dental treatment appointment. Group 1: score of 2.51 on BPRS; Group 2: score of 9.99 on BPRS. No significant difference between groups on CFSS

Melamed et al. (1978)	Between groups design with 80 children aged 4-11 years	Group 1: Long video peer-model Group 2: Long demonstration video with no model Group 3: Short video peer-model Group 4: Short demonstration video with no model Group 5: Unrelated video as control	1. CFSS 2. PSI 3. BPRS 4. Dentist and observer ratings 5. Maternal anxiety 6. Heart rate	Video peer-model film children had fewer disruptive behaviours than those who watched the demonstration films. Children aged 6 and 8 years showed the largest difference between groups. An observer rated these children's anxiety post intervention as 2.2 (out of 7) for the peer-model film viewers and 4.2 for the demonstration film viewers
Mungara et al. (2013)	Between groups design with 90 children aged 5-9 years	Group 1: Video peer-model Group 2: Control	1. Parent version of CFSS-DS	Group 1 had significantly improved after viewing the video peer-model. Group 1: mean score on parent report pre-intervention = 30.2 (out of 75). Post-intervention = 23.27. Group 2 saw no improvement.
Sakthivel et al. (2013)	Between groups design with 40 children aged 6-12 years undergoing an orthopantomographic examination	Group 1: Audio-visual modelling Group 2: No modelling	1. Anxious and disruptive behaviour code (ADBC)	Group 1 had significantly fewer body movements and episodes of crying during the orthopantomographic examination compared to Group 2. Group 1: 6 behaviours; Group 2: 21 behaviours

Stokes and Kennedy (1980)	Multiple baseline design with eight children aged 7 years old undergoing dental treatment	Educational information combined with praise, consequences, and live peer-modelling	1.Observational behaviour checklist of disruptive behaviour	Reinforcement and peer-modelling reduced disruptive behaviour in the participants to a manageable level. Participant 1: pre-intervention = mean of 33% uncooperative behaviour, post-intervention = mean of 3% uncooperative behaviour

Peer-modelling. In 1975 and in 1978, Melamed and her colleagues used participant modelling where another child of similar age and gender modelled the desired behaviour for the child with dental anxiety and it showed the model child receiving dental treatment with calm and positive behaviour (Melamed et al., 1975a; Melamed et al., 1978). In the 1975(a) study, Melamed randomly assigned 16 children between the ages of 5 and 11 years to a peer-modelling group or a control group. Each child had two dental appointments at the clinic. Before any dental appointment, the children completed the CFSS with specific dental items and the PSI recorded perspiration on the child's hand, which indicated levels of anxiety. The child's overt behaviour during the appointments was rated on the BPRS. Before the second dental appointment, the children watched either a control film unrelated to dentistry or an experimental peer-modelling film (both 13-minutes long). The PSI was taken before and after the film and after the treatment. The researchers found that those children who watched the peer-modelling film displayed less fear and fewer disruptive behaviours at the dental clinic than the control group who watched the unrelated film. The modelling group had a score of 2.67 on the BPRS which was lower than the control group's score of 5.59. After watching the film, the self-reported scores on the CFSS and the PSI

ratings decreased more in the experimental group compared to the control group, however this was not significant. It was thought that the dental video helped fearful children cope with the treatment because they knew what to expect and were more mentally prepared compared to the control group. The researchers speculated the results may not be fully attributable to the child model and that it could be the exposure to the dental stimuli that helps decrease anxiety in children. They tested this hypothesis in the study described below.

Melamed et al. (1978) compared a peer-model film with a dental demonstration film to investigate which was more effective for children. The dental demonstration film depicted a dentist outlining what would happen in a dental appointment and this did not include a peer-model. The peer-model film was very similar but it depicted a child undergoing the dental procedures. Eighty children between the ages of 4 and 11 years were divided into five groups based on age, gender, ethnicity, scores on the CFSS, and prior dental experience. The researchers created a long version and a short version of the peer model film and the dental demonstration video to compare effectiveness. The five groups were therefore: long version peer-model film, short version peer-model film, long version demonstration film, short version demonstration film, and an unrelated film as a control group. Children underwent a dental examination and had their teeth cleaned in their first appointment. In the second appointment 7 – 10 days later the children had a filling placed. The children watched one of these films based on their group assignment immediately before their second dental appointment. The PSI measured perspiration before each dental appointment and before and after the film was watched. The BPRS was used during the dental appointments. In addition, the children's heart rate was recorded using a Grass polygraph while they viewed the film and during treatment.

Results demonstrated that children who watched the peer-model films had less reported dental fear than children who watched the dental demonstration films. Children in the peer-model groups demonstrated more cooperative behaviour with the dentist than the demonstration groups. Furthermore, higher physiological arousal (heart rate) was recorded in children while watching the dental demonstration films. In comparison, physiological arousal decreased while children watched the peer-model films. This finding suggests that watching another child similar to the participant decreased the child's fear and anxiety levels more so than watching the dental demonstration films without a model. The demonstration films appeared to create more physiological arousal and this finding suggests that peer-modelling could be a safer intervention and be less traumatic for children with dental anxiety. When comparing age groups, younger children between four and six years self-reported lower fear levels after viewing the long versions of the films regardless of whether a demonstration or peer-model was depicted. The heart rate data, however, suggested that physiological arousal was still high for the children while viewing the dental demonstration films. The researchers concluded that providing more information in a longer film was not sufficient.

Video modelling may be a safer intervention option for children because it involves less intensive therapy, does not require recollections of previous negative experiences like in CBT, and it does not require any medication (Melamed et al., 1975a). The research discussed above has only tested video peer-modelling with dental anxiety and has not considered video self-modelling. This may be because exposing children with dental anxiety to a dental environment would be needed to obtain the video footage for the self-model intervention. This may have led researchers to use peer-modelling as it is more convenient since the model would not be anxious. Peer-modelling, however, requires researchers to obtain consent from the child model and

their family, as well as the child who will watch the modelling video (Bellini & Akullian, 2007). This can take more of the researcher's time and effort than using a VSM intervention.

Part IV: Video Self-Modelling

Video self-modelling, by definition, is a type of video that depicts a person (the model) performing certain behaviour. The behaviour displayed in the video is something the person cannot do, therefore creating the opportunity to learn from oneself. The unique aspect of VSM is that the viewer of the video is the same person as the model, hence the term "self-model" (Dowrick, 2012). Meta-analyses and reviews by Dowrick (1999), Bellini and Akullian (2007), Collier-Meek, Fallon, Johnson, Sanetti, and Delcampo (2012) indicate that VSM as an intervention qualifies as evidence-based practice.

Many years of research has also shown that VSM is an effective intervention for teaching new skills and eliminating undesired behaviour (Prater, Carter, Hitchcock, & Dowrick, 2012). A review by Buggey and Olge (2012) found that out of 47 studies, 44 indicated the effectiveness of VSM. Some of the behaviours targeted in these studies were stuttering, social initiations, noncompliant behaviour, swimming skills, grammar, classroom participation and selective mutism. People of all ages have been included in VSM studies with ages ranging from three years to mature adults (Buggey & Olge, 2012).

The premise of VSM is that watching oneself perform an act that they cannot do can strengthen the idea in that person that performing that act is doable (Dowrick, 1999). The VSM is focussed on the positive behaviour that is desired and does not require the person to view images of incorrect behaviour (Buggey & Ogle, 2012). For example, when a child has dental anxiety, watching a positive video of a dental visit

without any traumatic events occurring can demonstrate (model) to the child that the situation is not as scary as they thought and thus is doable.

Processes involved in VSM. VSM is based on Social Learning Theory, which argues that most behaviour is learned from experience, whether it is from direct experience involving reinforcement or from observing other people (modelling) (Bandura, 1971). For one to learn through observation, Bandura (1971) states that four requirements must be met before learning can take place. Firstly, attention must be attained; it would be impossible to learn from a model if the observer was not focused on their behaviour. Secondly, the observer must retain the information they have observed. When viewing a model, a visual image of the behaviour is formed in the observer's memory and this can be retrieved from memory when in a similar situation. Thirdly, the observer must acquire the new skill and be physically able to perform it in order to reproduce the behaviour. Lastly, the observer must be motivated to perform the learned behaviour, either through reinforcement or because it is a favourable response in a particular social situation. These requirements also apply to learning via VSM as VSM is a form of learning through observation.

Peter Dowrick is one of the key researchers in VSM and he states that using oneself as a model provides the perfect set up, as the "self" grasps the viewer's attention more so than using a peer-model (Dowrick, 1999). This aspect helps to achieve the requirement of attention as mentioned above by Bandura (1971). Dowrick (2012) states that VSM produces faster and larger changes in behaviour compared to using reinforcement techniques, CBT, or occupational therapy. For example, a 5-year-old girl who experienced difficulty in her walking coordination improved her walking more after watching a 2-minute VSM six times than she did with occupational therapy sessions twice a week for the previous six months. Furthermore, children in a study by

Kahn, Kehle, Jenson, and Clark (1990) experienced more behavioural change after 21 minutes of viewing time of a VSM compared to other children who had 30 hours of CBT sessions.

The fast learning process demonstrated by VSM could be related to neurological processes. When observing a person's behaviour, mirror neurons become activated in the observer. This means when a person views a VSM film, the neurons required to perform the modelled behaviour become activated in the observer's brain even when they are sitting still (Dowrick, 2012). Mental time travel is another proposed theory for why VSM leads to behaviour change. Mental time travel is the human ability to visualise future or past situations. This ability helps to plan future events and shape future behaviours thus facilitating behaviour change (Suddendorf & Corballis, 2007). VSM therefore provides an image of futuristic behaviour and the human brain is neurologically equipped with the ability to revisualise the behaviour and to replicate it.

Aspects of VSM interventions. A completed VSM is normally between two to four minutes long and the footage depicts a person performing a task perfectly. The undesired behaviours from the original footage can be carefully cut out of the video, leaving a concise view of the goal (Prater et al., 2012). Dowrick (1999) explains that when working with an anxious child, social support such as a parent being available can be given during the filming of the video so the child can be calmed and comforted. The parent can then be cut out of the video so the child only sees them self coping independently.

Types of VSM. There are two types of VSM interventions: positive self-review and feedforward. Dowrick (2012) explains that a positive self-review VSM depicts an individual performing a specific behaviour that they can occasionally achieve on their own. The aim of this form of VSM is to increase this desired behaviour and to help the

individual master it. The feedforward technique, in contrast, is used to help individuals learn skills that they do not have currently in their repertoire. A feedforward VSM therefore shows a futuristic view of the individual performing these skills. VSM in general helps show the viewer what they look like when performing the desired behaviour. This helps them learn the best way to achieve that goal and it helps them believe that it can be achieved (Prater et al., 2012). As mentioned above, VSM has not been used with children with dental anxiety. There have been similar types of videos created but they have not been tested scientifically.

A similar style of video has been created by an organisation focused on helping children with autism, called Look at Me Now (2012). The organisation has several videos of children doing everyday things, such as brushing teeth, going to school, and going to the dentist. The videos are personalised and an image of the child's face is cropped and placed onto a model's body who is acting out the behaviour in the video. The end result looks like the child with autism is performing the task correctly. This is not considered VSM because the child's body is not in the video, it is only the picture of their face placed on a model's body. Also, the image of the face does not change since it is not video footage. This decreases the realistic look of the video.

There is another technique used in VSM called point-of-view modelling. A point-of-view VSM depicts what the target individual would see in the target environment. In this way, the camera acts like the individual's eye and provides a video from their point-of-view (Hine & Wolery, 2006). For example, Hine and Wolery (2006) created a point-of-view VSM for children with autism that depicted specific skills for playing with toys. The camera was held at eye level and the VSM showed only the researcher's hands as it manipulated the toys. This makes the viewer feel as if they are performing the tasks in the video. Point-of-view VSM therefore does not involve peer-models and does not

include video footage of the participants. The use of adult hands in this study also did not prevent the children from identifying with the video. This technique allowed modelling to occur but did not put the target individual in an uncomfortable situation.

The current literature on dental anxiety summarised above used video peer-modelling for children with dental anxiety. While this was effective for some children, it requires the use of a model to create the VSM. This involves further ethical consent from the child model and their family and can cause time delays in the production of the intervention (Hine & Wolery, 2006). Furthermore, video self-modelling has never been used with children with dental anxiety because it would involve filming the children in a dental clinic which would cause anxiety. To avoid the above issues, the current study used point-of-view VSM where the researcher created an intervention with only the participating children and the filming of the dental environment was completed without involving the children. The children were then not put in a stressful situation and the researcher created the VSM efficiently.

Aim of Thesis

The aim of this thesis was to investigate if point-of-view video self-modelling was an effective intervention for children with dental anxiety. The intervention was used with primary school children aged seven years old.

The specific research question to be addressed was:

1) Can dental anxiety in primary school children be reduced through the use of a point-of-view video self-modelling intervention?

Chapter 2

METHOD

Study Design

A single-case design was used to assess intervention outcomes in this study. This type of design focuses on a small group of participants and allows their individual data to be preserved (Blampied, 2001). There is no calculation of averages across participants. A key component of this design is to separate the data into stages of time for each participant across baseline, intervention, and post-intervention phases. Participants are usually measured repeatedly as the intervention progresses through these phases, and this ideally should show the participant improves over time. Having multiple participants' helps to show if the intervention effects are replicated across people, and the separate phases help to show exactly when the intervention was responsible for any changes and supports it effectiveness (Blampied, 2001).

With the current time frame of one year for this project, the number of participants included was small. This small sample meant that other statistical method, such as null hypothesis testing would not be beneficial to use as this is based on averaging across large amounts of participants (Blampied, 2001). A single-case design was therefore chosen as this design could depict the participants' data individually and help show if the intervention was effective. Causal inferences could also be drawn because measurements were taken throughout the intervention process, therefore changes that occurred only once the intervention was introduced could be attributed to the intervention (Blampied, 2001).

Ethical Considerations

This project received ethical approval from the Educational Research Human Ethics Committee at the University of Canterbury. Please see the letter of approval in

Appendix A. Before this project commenced, informed consent was obtained from the primary school's principal, the teachers, the parents/guardians, and the children. The process of how permission was obtained is explained for each group below.

Recruitment of Participants

Principal and teachers. The researcher emailed eight principals of schools in Christchurch to ask for their involvement in the study. An information sheet outlining the study was attached in the email. If the principal was interested, the researcher asked if she/he could inform the teachers about the study. If they accepted, the researcher then took hard copies of the information sheets and consent forms to the school for the principal and teachers to complete. The researcher then returned to the school to retrieve the completed forms three days later. The researcher offered to meet with the principal and teachers to answer questions, but this was not required. The information sheets and consent forms are displayed in Appendices B – E.

Parents/guardians. Consent from the parents/guardians included 1) the parents/guardians of the children undergoing the screening measure, and 2) the parents/guardians of the children undergoing the intervention. The information sheets and consent forms for parents/guardians are displayed in Appendices F – I.

Screening. The researcher gave the teachers an envelope for each of their students. The children took the envelopes home to their parents/guardians. The envelopes contained the parent/guardian information sheet for the screening phase, the child information sheet for the screening phase, parent/guardian consent form, child consent form, and the screening measure. Parents/guardians were asked to help their child complete the screening measure and the child consent form if they agreed to participate. The information sheets informed the parents/guardians that if the number of eligible children exceeded the number that could be managed for this project, a

maximum of six children would be selected at random. The parent/guardian's information sheet was also translated into Mandarin as some of the students were of Chinese descent. The translated form was provided in addition to the English version for nine families. The children returned the completed forms in the envelopes to their teacher for the researcher to collect. Specific details about the screening process are described below in the section, Screening Test Procedure.

Study entry. After reviewing the returned screening questionnaires, parents/guardians of the eligible children were emailed and permission was requested for their child to participate in the next stage of the project. An information sheet and consent form for the intervention phase was emailed to them which outlined the project in full and what would be required of them and their child. The researcher offered to have a meeting with the families to answer questions and/or discuss the project more with them. If parents/guardians agreed, the consent form was signed and returned to the school with the child for the researcher to collect.

Children. Consent from children included 1) the children undergoing the screening measure, and 2) the children undergoing the intervention. All the information and consent forms for the children are displayed in Appendices J – M.

Screening. The children took home the envelopes with the study's screening information sheet and consent form to their parents/guardians. The child's parent/guardian read the forms to the child and if it was requested, the researcher met with them to answer any questions. All forms were written in age appropriate language. If the parents/guardians and the child agreed, they completed the consent forms and the screening measure together. Completed forms were taken to the child's teachers in an envelope.

Study entry. From the results of the screening measure, children with dental anxiety were selected. Once the parents/guardians provided consent to the project, these children were given an information sheet and consent form that was written in age appropriate language. The child's parent/guardian read this to the child and if it was requested, the researcher met with them to answer any questions. If the child agreed to join the project they were asked to sign a consent form. Completed forms were taken to the child's teachers in an envelope.

Recruitment Criteria and Participants

To be eligible for this study, children had to score between 32 and 50 on the CFSS-DS screening questionnaire. This result indicated mild to moderate dental anxiety. Forty-four children were provided with the screening measure at their school. Eleven children returned the screening measure to their teacher and four of these children were eligible for the intervention. Of the eligible children, two agreed to participate. The participating children were aged seven years old, attended two different primary schools in Christchurch and were selected based on their level of dental anxiety as rated by a self-report screening measure adapted from Cuthbert and Melamed (1982). This screening measure can be found in Appendix N. Children with disabilities were included in the project given they were able to understand what was required of them for the project and gave consent to be included. Information about the children screened is displayed in Table 3 and information regarding the selected two participants is displayed in Table 4.

Table 3
Characteristics of Children Screened

	Total number of children
Children screened	44
Males	22
Females	22
Disability	0
Total screening measures returned	11
Children under cut-off score (below 32)	6
Children over cut-off score (above 50)	1
Eligible children (between 32-50)	4

Table 4
Characteristics of Participating Children

Intervention participants	Age	Gender	Screening measure score
Sally	7	Female	35
Betty	7	Female	47

Setting

Participants were from two primary schools in Christchurch (decile 9 and 8). Participants were videoed at the school and all measurements occurred in a quiet room at the school. In one school, the room was the teacher's office connected to the classroom. In the second school, the room was a spare classroom. Other classmates could not overhear the meetings. A desk and two chairs were used for the researcher and participant to sit side by side. The rooms were lit by fluorescent lighting. Health and safety rules were followed in both schools.

Screening Test Procedure

As mentioned above, the children in the classroom were given an envelope to take home to their parents. The written instructions for the children on the screening questionnaire stated: "Please circle how you feel about the items below. A score of 1 means you are not afraid at all, to a score of 5 means you are very afraid. There are faces below each number to help you decide how you feel. In Part 2, if you have never

experienced the situation, please circle Not Applicable." (Refer to Appendix N for a copy of this measure).

Children then answered each of the 15 questions by circling one cartoon face that represented their current feeling. Parents/guardians were present and helped their child read and understand the questions. If a question did not relate to a child, they could circle Not Applicable for the last 5 questions about receiving dental treatment. This took approximately 10-15 minutes.

Once the children's scores were collected, the parents/guardians were informed of their child's result through email. Two children who met criteria for the study were selected and invited to participate.

The eligible children (and their parents/guardians) who did not want to be in the study were provided a handout with a list of appropriate services that work in the area of dental anxiety (Appendix O). In addition, children who also scored over the cut-off on the screening measure (51 and above) were not eligible because this score indicated very high levels of dental anxiety. Their parents/guardians received the same handout mentioned above so that they could seek assistance if they so desired. This screening procedure is outlined in Figure 1 below.

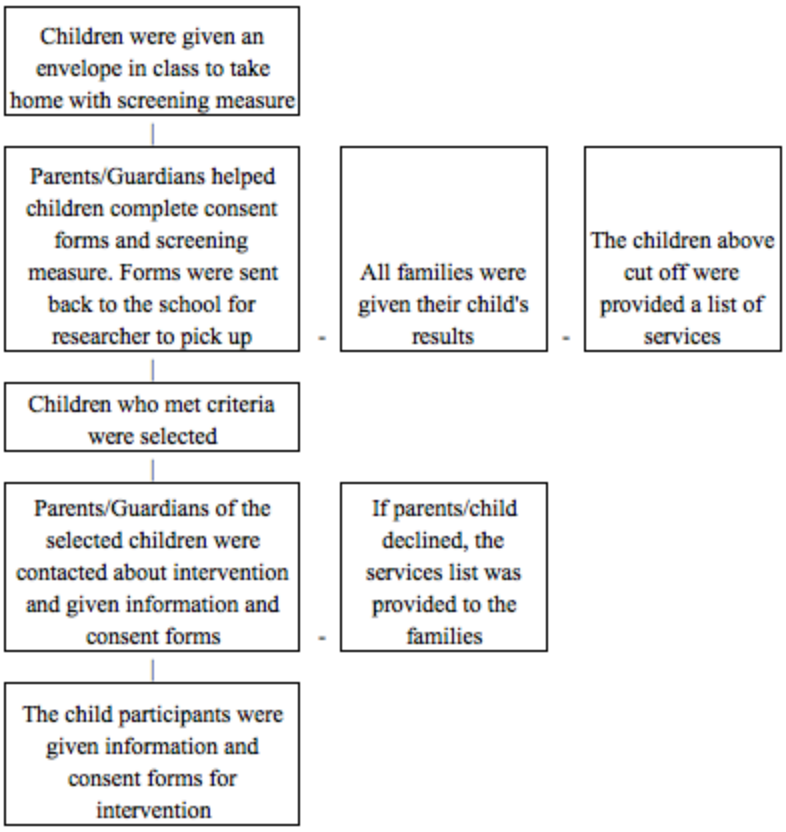

Figure 1. Children's screening procedure for dental anxiety undertaken at home.

Apparatus

The following items were used in this study.

Video camera. The videos for the VSM intervention were recorded on a small, high-definition SportsCam camera. A tripod was also used to help stabilise the camera.

Digital camera. A Canon digital camera was used to take photos of dental stimuli for the Behavioural Avoidance Test images.

Green screen. A large green piece of material was used as a green screen. The children were videoed in front of the green screen so that their image could be superimposed on top of the dental environment.

File converter. AnyVideo Converter HD 3.0.1 was used to convert the files downloaded from the camera. The original files from the camera were in AVI format.

AnyVideo Converter HD converted these files to MOV format, allowing them to be uploaded to iMovie for editing.

iMovie. The videos were edited on iMovie 10.0.8 to develop the individual child's VSM. Still images were also taken from iMovie for the pictures in the Behavioural Avoidance Test. Screenshots were taken of the video footage in order to collect individual pictures.

Pulse oximeter. A pulse oximeter was used to record the participating children's heart rate. This is a small device shaped like a clothespin that was placed on the child's finger. It did not hurt and was less invasive than wearing a heart rate monitor in a chest strap.

Viewing equipment. The children watched their videos on the researcher's computer at their school. The computer was a 2009 MacBook Pro running OS X Yosemite version 10.10.5 with a 13-inch screen.

DVD-R discs. Writable DVD-R discs were purchased to download the children's VSM from the researcher's computer. This allowed the children to take their intervention video home after the study.

Measures

Child self-report. The *Children's Fear Survey Schedule-Dental Subscale* (CFSS-DS) was a self-report questionnaire aimed at measuring the amount of anxiety felt towards specific dental stimuli (Mungara et al., 2013). This measure had been designed for children between 4 and 12 years old (Melamed & Lumley, 1988). Participants rated how anxious they felt about 15 situations on a 5-point scale, where 1 is "not afraid at all", 2 is "very little", 3 is "moderate fear", 4 is "pretty much afraid" and 5 is "very much afraid". For example, item 13 asked children to rate how they felt about the sight of the drill; item 14 asked the child to rate how they felt when the dentist was drilling

their tooth; and item 15 requested the child to rate the noise of the drill. The children were provided with cartoon faces that corresponded with the rating scale to assist them in answering the questions. The cartoon faces were gender specific to help the children relate to the scale. The full female version of the measure is shown in Appendix N and the male cartoon faces are displayed in Appendix P.

The CFSS-DS has sound psychometric properties. Test-retest reliability has been rated at .86 (Melamed & Lumley, 1988). This measure demonstrates convergent validity as it has been positively correlated with the Behaviour Profile Rating Scale (BPRS) which is an observational tool used to measure dental anxiety (Melamed & Lumley, 1988). The CFSS-DS has also been correlated with other physiological and fear measures, with correlations from $r = .22 – .87$ (Berge, Veerkamp, Hoogstraten, & Prins, 2002). Researchers have argued that the CFSS-DS is not a complete self-report measure as it does not include questions related to the child's negative cognitions about the dentist (Al-Namankany et al., 2012). The CFSS-DS, however, is the most widely used self-report measure for child dental anxiety and there are studies supporting its usefulness (Melamed et al, 1978). The Corah Dental Anxiety Scale has also been widely used, however, it was not fit for this study as it has never been used with children (Corah, 1969). The measures are similar as both ask how the patient feels during parts of a dental procedure. There is no other "gold standard" measure currently for children with dental anxiety (Al-Namankany et al., 2012).

Heart rate. When working with people with anxiety, researchers argue that heart rate measures should be a part of the assessment battery in conjunction with behavioural and cognitive measures (Davis, May, & Whiting, 2011; Lydon, Healy, O'Callaghan, Mulhern, & Holloway, 2014). Measuring behavioural, cognitive, and physiological responses help to determine outcome effects more accurately and it shows what aspect

of anxiety an intervention targets (Davis et al., 2011). Heart rate monitors and pulse oximeters have therefore been used to measure anxiety levels and any change in anxiety after interventions (Melamed et al., 1978; Naithani & Viswanath, 2014). In order to determine if heart rates are abnormal, normative heart rate data should be researched. Fleming et al. (2011) investigated the normal heart rate ranges for children through a systematic review of 59 studies. Children aged six and seven were found to have a median heart rate of 90-95 beats per minute. These rates were used for comparison against data collected from participants in this study. Children in this project wore a pulse oximeter to record heart rate levels at baseline measurements, during the VSM viewing and intervention measurements, and during the post-intervention BAT.

Behavioural measure. The *Behavioural Avoidance Test* (BAT) was used as a behavioural measure of child anxiety. This test aims to measure how close children can get to their feared stimulus (Bernstein & Nietzel, 1973). A traditional BAT would typically involve a researcher who guides a participant through a number of difficult tasks (Barrett, Healy, & March, 2003; Jerremalm, Jansson, & Öst, 1986). The tasks become gradually more difficult and the participant is able to continue through the tasks until they want to stop (Barrett et al., 2003).

The BAT can be used as an outcome measure, however, no standard procedure exists on how to administer it and therefore different methods and instructions have been used (McGlynn, 1988). One particular issue with the BAT is its sensitivity to procedural factors. Bernstein and Nietzel (1973) investigated how procedural differences influenced BAT results and they found face-to-face instructions were more effective for participants and these participants approached closer to the feared stimulus than participants who received tape-recorded instructions. These researchers also found

that the context in which the test was given made a difference; a lab context created faster performance times compared to a clinic context.

In this current project, the researcher was not able to measure the children in a real dental environment as in the study by Jerremalm et al. (1986). Therefore, she was unable to administer the BAT in the traditional sense. Alternatively, the researcher collected a range of images of dental stimuli (see Appendix Q). This included five photos of a dentist, the dental chair, and the dental tools. The children were shown the images and asked to rate their level of fear of the photo item. The rating form for the BAT is displayed in Appendix R.

Development of the VSM Videos

The development of the VSM videos involved three stages. First, video footage was taken of a dentist in a dental clinic. The video footage captured the dentist performing a regular dental check-up and explaining the main purpose of the dental tools and procedures. The video footage was taken as if the camera was the child's eye, so it captured what the child would see if they were undergoing their dental appointment.

Second, video footage was then taken individually of the children in their school in front of a green screen. The children were asked to recite, "I'm (name) and this is my dental check-up. This is what I will see at the dentist". Then they said, "I got a sticker from the dentist because I did so well".

Third, the dentist video footage and the children's video footage were combined. Video files were converted using AnyVideo Converter from AVI files to MOV files. These files were then imported into iMovie. The video footage of the dentist was used as a template and two separate movies were created that contained this template. The video footage of the individual children was then put into each child's individual VSM

intervention. The green screen editing function was used to superimpose the child's image onto the dental clinic backdrop. The resulting video footage (VSM) looked as though the child participant went through a dental examination without displaying anxious responses. The added advantage was that the children were never in the dental environment.

Description of the VSM video. The total time of the VSM intervention was 3 minutes and 22 seconds for both participants' video. The completed VSM video started with a view of the child standing in the waiting room. The child then stated, "I'm (name) and this is my dental check-up. This is what I will see at the dentist". The video footage then changed to show a point-of-view camera angle. The VSM showed the waiting room from the angle of the child as if they were sitting in a chair. The dentist then called the child in. The dentist then guided the child down the hall and into the dental surgery room and dental chair.

The dentist continued to explain the procedure for the appointment, such as, counting teeth and taking x-rays. The dentist put safety glasses on the child and the camera showed the glasses moving towards the lens as if the child is putting them on. The dentist put gloves and a mask on and explained they are to protect himself. The dentist reclined the dental chair and the point of view changed to show the ceiling and the dentist working above. The overhead light was then turned on and the dentist introduced it and his tools for counting teeth. The view then changed to show the inside of the child's mouth, but only the teeth and the dental tools counting the teeth were shown. The mouth shown was a model that helped in the filming process. The x-ray holder was then shown to the child and the dentist explained he will bring the camera in to take photos of their teeth. The dentist's tools were then introduced to the child. The water spout was shown first. The dentist blew air on his hand and squirted water on the

side table. The video captured the sound of this to familiarise the child with it. The drill was shown next and the noise it made was also captured. The child's finger was taken by the dentist and he slowly put the drill on the finger nail to show the child the vibration and that it did not hurt. The model's finger was used in this scene. The suction was then introduced. The dentist shot water on the side table and demonstrated how the suction cleaned up the water. The dentist removed the safety glasses and the chair was brought back up. A sticker was then given to child for doing such a great job.

The scenes of the video were broken up by title pages that introduced the next stage of the check-up appointment. For example, there were titles that stated "starting the check-up", "let's count your teeth", "x-rays", and "the dentist's special tools". The ending also had a title that states, "You did it. Well done."

It is important to note that before the dentist did anything, he explained what he was doing and showed the child his tools. This allowed the child to comprehend what was going on and the child was not forced into anything. This procedure followed the recommendations from Nelson, Sheller, Friedman and Bernier (2015) who stated the importance of a calm and friendly dentist for child patients. This VSM intervention may therefore be a useful way to prepare children in general for their dental visit regardless of whether they have anxiety or not.

Procedure

The procedure of the intervention is outlined in Figure 2 and described below.

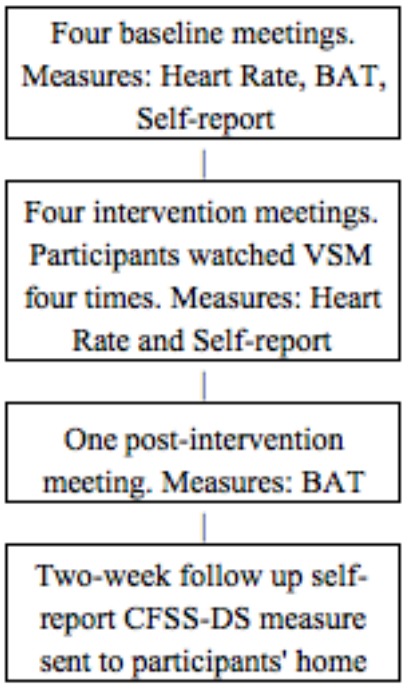

Figure 2. The four phases of the study.

Baseline. After the screening procedure, the researcher arranged meetings for baseline measures at the two participant's classroom. The meetings were individual and the participants had their heart rate measured while completing the short version of the CFSS-DS and the BAT measure. This meeting was videoed in order to capture the pulse oximeter reading and to match this with what question the child was answering at the time. Each meeting took approximately 15 minutes. There were four baseline meetings for each participant that occurred two times a week for two weeks.

At the end of the last meeting for baseline measures the participants were videoed for their VSM intervention. The participants stood in front of the green screen and stated "I'm (name) and this is my dental check-up" and then stated "I got a sticker from the dentist because I did so well". The participants were reading theses lines off cue cards held up by the researcher. The green screen was pinned on a wall in the meeting rooms at school.

Intervention. The participants viewed their VSM with the researcher in a meeting room at school for four separate sessions, twice a week for two weeks. During the viewing the participants had their heart rate measured. Directly after the viewing, the participants completed the short version of the CFSS-DS.

Post-intervention. After the participants viewed their VSM for the fourth time at the last intervention meeting, the final BAT questions were given to the participants to complete.

Follow-up. The participants completed a follow-up measure two weeks after their VSM intervention. The CFSS-DS questionnaire was emailed to the parents/guardians and they were asked to help their child complete it. The participants completed the questionnaire on their home computer by highlighting their responses. The completed questionnaire was then emailed back to the researcher. The times each measurement was taken throughout the project are summarised in Table 5 below.

Table 5
Summary of Measures and Measurement Times.

Measure	Screening Measure	Baseline Measures	Intervention Measures	Post Intervention Measure	Follow-up Measure
CFSS-DS	x	x	x		x
Heart Rate		x	x	x	
BAT		x		x	

Data Analysis

The participants' self-report scores were calculated by adding together the scores from the 15 questions on the CFSS-DS questionnaire. Responses were on a Likert scale ranging between one to five. If a participant selected, "Not Applicable", a score of 1 was recorded.

Heart rate scores were calculated by taking the mean heart rate during the CFSS-DS, the BAT, and the VSM viewings for each session. To calculate the mean, the pulse oximeter was videoed throughout each session while the participant had it placed on their finger. The heart rate reading fluctuated values every few seconds. The video footage of the pulse oximeter was then viewed by the researcher after the participants' session and the data was recorded according to what measure the participant was completing. For example, in the baseline sessions, heart rate data was divided into resting heart rate, heart rate during the CFSS-DS, and heart rate during the BAT. For the intervention sessions, heart rate data was divided into resting heart rate, heart rate during the VSM, and heart rate during the CFSS-DS. For each measurement, the different heart rate readings from the pulse oximeter was recorded in a list and then the mean was taken. This gave a mean heart rate value for each measurement for each session.

BAT scores were calculated by totalling the scores from each question. Scores were of a number value between one and five.

Chapter 3

RESULTS

The aim of the VSM intervention was to reduce dental anxiety in two female children aged seven years old. The participants both had mild dental anxiety as rated through the dental screening measure CFSS-DS.

The two participants' dental anxiety levels were recorded through three types of measurements: self-report using the CFSS-DS, physiological using a pulse oximeter, and behavioural using a Behavioural Avoidance Test.

Individual Participants' Results

The sections below summarise the data collected for the two participants.

Participant Sally. On the CFSS-DS measure Sally rated that she was most afraid of choking and the injection when visiting the dentist. The data from the VSM intervention appeared not to make an effect on Sally's rating on choking or on injections.

Taken with her mother at home, Sally had an initial self-report score of 35 on the CFSS-DS screening measure. The following four baseline scores on the CFSS-DS were lower ranging from 27 - 31 (M = 29). The data is displayed in Figure 3. Over the four intervention sessions, Sally's anxiety scores decreased slightly from baseline and ranged from 23 - 26 (M = 24.25). A score of 32-50 indicated mild dental anxiety and Sally was below this cut-off after the VSM intervention started and she maintained this score at the two-week follow-up.

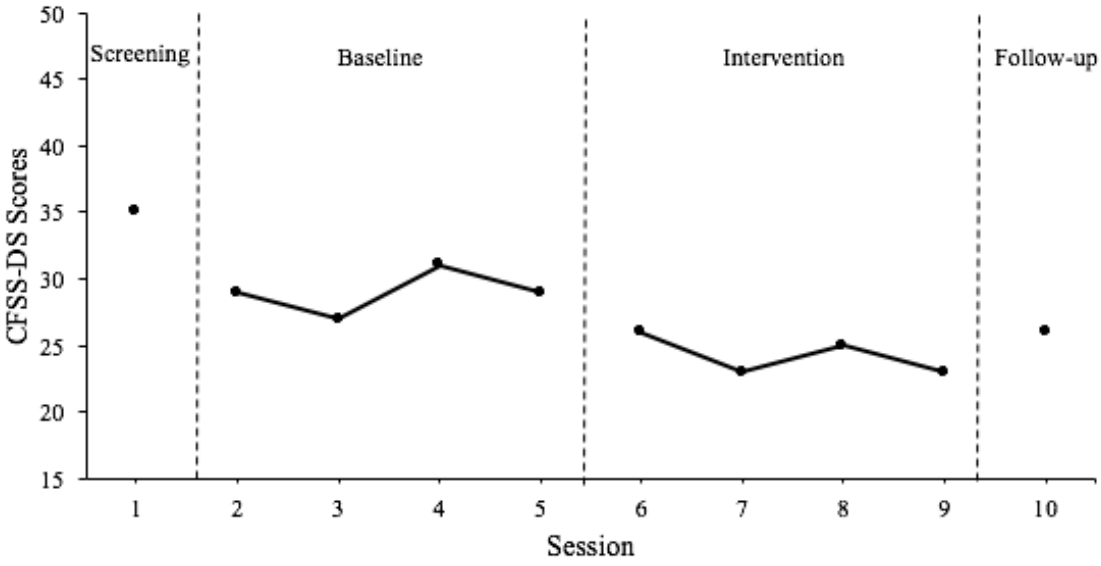

Figure 3. Sally's self-report scores from CFSS-DS during screening, baseline, intervention, and follow-up sessions.

Sally's total score on the BAT was 7 for the first three baseline measures but then increased to 8 on the fourth baseline session. At the post-intervention session Sally scored 5, a decrease of 3 scores from the baseline scores. She scored a 1 on each image during the post-intervention session which is the lowest fear rating possible. BAT scores are displayed in Figure 4.

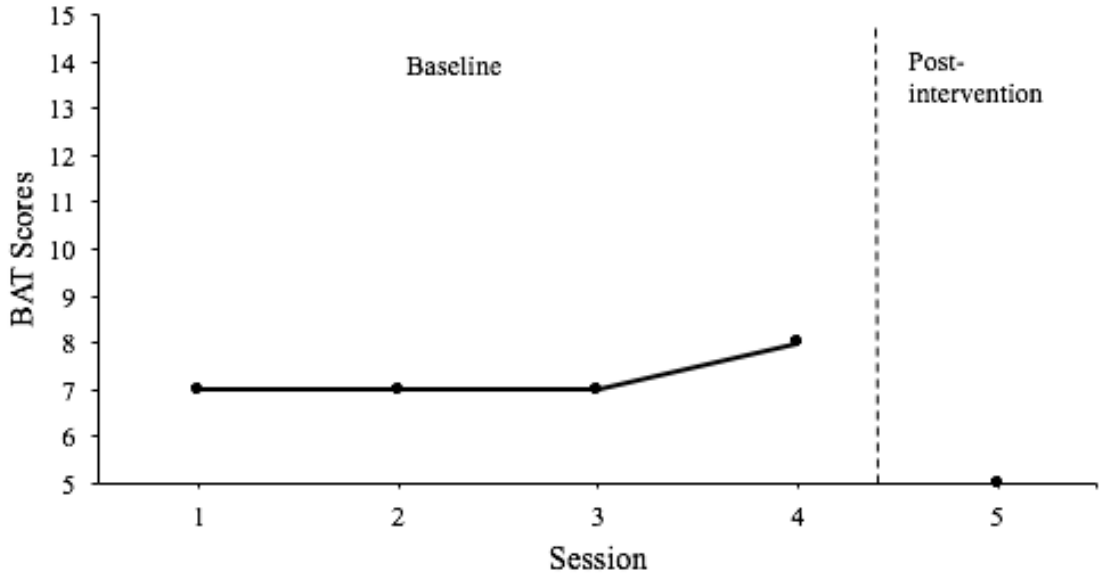

Figure 4. Sally's Behavioural Avoidance Test scores for baseline and post-intervention sessions.

The first BAT took Sally 2 minutes and 33 seconds to complete. The following BATs were completed at a much faster rate, with the fastest time recorded at 45 seconds. The time of each BAT completion is displayed in Table 6.

Table 6
Completion Times for Sally's Behavioural Avoidance Test.

Session	Time
1	2 minutes 33 seconds
2	2 minute 4 seconds
3	1 minute 20 seconds
4	1 minute 10 seconds
5	45 seconds

Sally's heart rate data is displayed in Figure 5. For each session, the mean heart rate value is displayed for each anxiety measure, for resting periods, and during the VSM viewing times. Normative heart rate values for seven-year-old children is on average 90-95 beats per minute (Fleming et al., 2011). Heart rate values for seven-year-old children can range between 60 and 125 beats per minute (Fleming et al., 2011). Based on these values, Sally's heart rate was never out of the normal range as her heart rate ranged from 69 – 101 beats per minute.

It was difficult to draw conclusions from this data, as there was no apparent trend. Sally's heart rate fluctuated during the baseline and intervention sessions and it was difficult to determine if the arousal was related to the dental stimuli presented to her. Sally's heart rate was lowest on the third baseline session during the resting period (a mean of 69 beats per minute) and was highest on the second baseline session during the resting period (a mean of 101.5 beats per minute). There was no difference between these sessions and the same procedure occurred. The differences in heart rate could therefore be due to individual factors. This is discussed further in the discussion chapter.

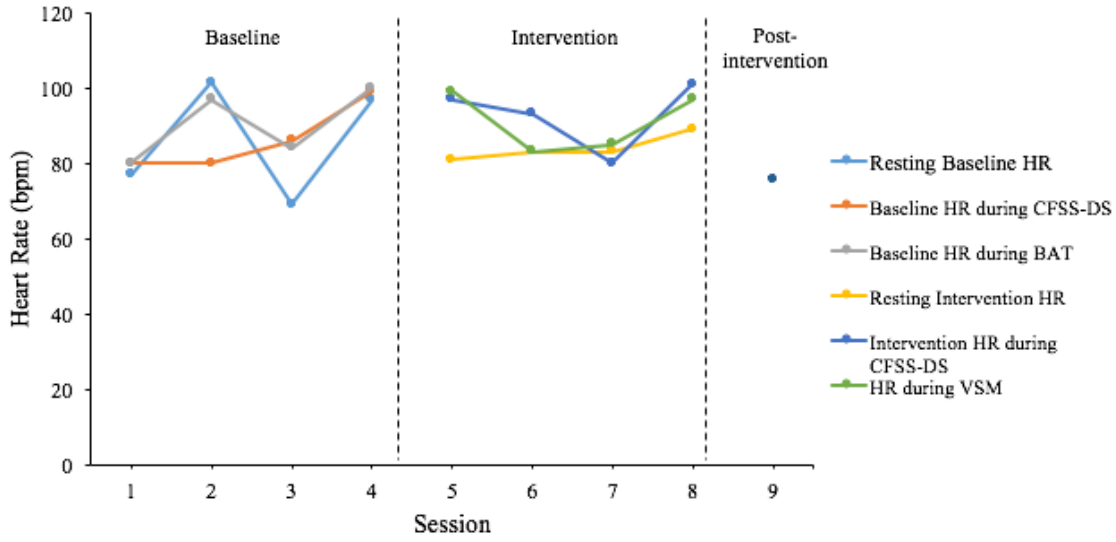

Figure 5. Sally's mean heart rate scores in beats per minute during baseline, intervention, and post-intervention sessions.

At the completion of the intervention Sally no longer met the criteria for mild dental anxiety. Her self-report scores were below the 32-50 cut-off range and her BAT scores were the lowest possible at the post-intervention session. These findings suggest that the VSM intervention was able to reduce Sally's mild dental anxiety. Her heart rate values did not reach abnormal levels which suggests she was not overly distressed during the sessions or when discussing dental situations. The heart rate levels did not appear to change across the intervention.

Participant Betty. On the CFSS-DS measure Betty rated that she was most afraid of hospitals and injections. The data from the VSM intervention appeared not to make an effect on Betty's rating on hospitals or injections.

Betty had a high self-report score of 47 on the initial CFSS-DS screening measure. This data is displayed in Figure 6. Her responses were then lower in the following four baseline measures ranging from 46 – 37 even though each baseline session was the same. The scores of 46 – 37 are within the dental anxiety cut-off range of 32- 50.

On the first intervention session, Betty's self-report score decreased to 30. This finding indicated that the VSM had some effect on her self-reported dental anxiety. Betty completed the intervention stage with a dental anxiety score of 32 and her final score at the follow-up meeting was 26. This final score is below the mild dental anxiety range of 32 – 50.

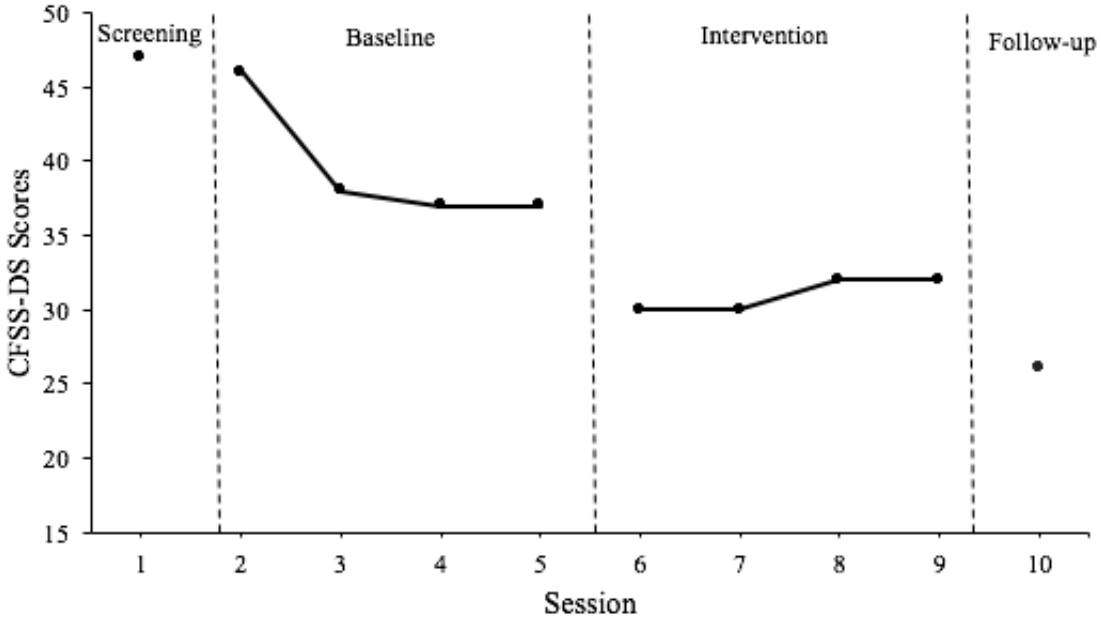

Figure 6. Betty's self-report scores from CFSS-DS during screening, baseline, intervention, and follow-up sessions.

Betty's scores on the BAT were stable throughout the baseline sessions and the post-intervention session. This data is displayed in Figure 7. The BAT scores range from 5 – 25. A floor effect could be one reason for this finding. Betty's scores of 9 and 10 were therefore in the lower spectrum. Betty scored a 1 or 2 on each image of the BAT. This represents "not afraid at all" and "a little afraid". The measure did not appear to record change for Betty.

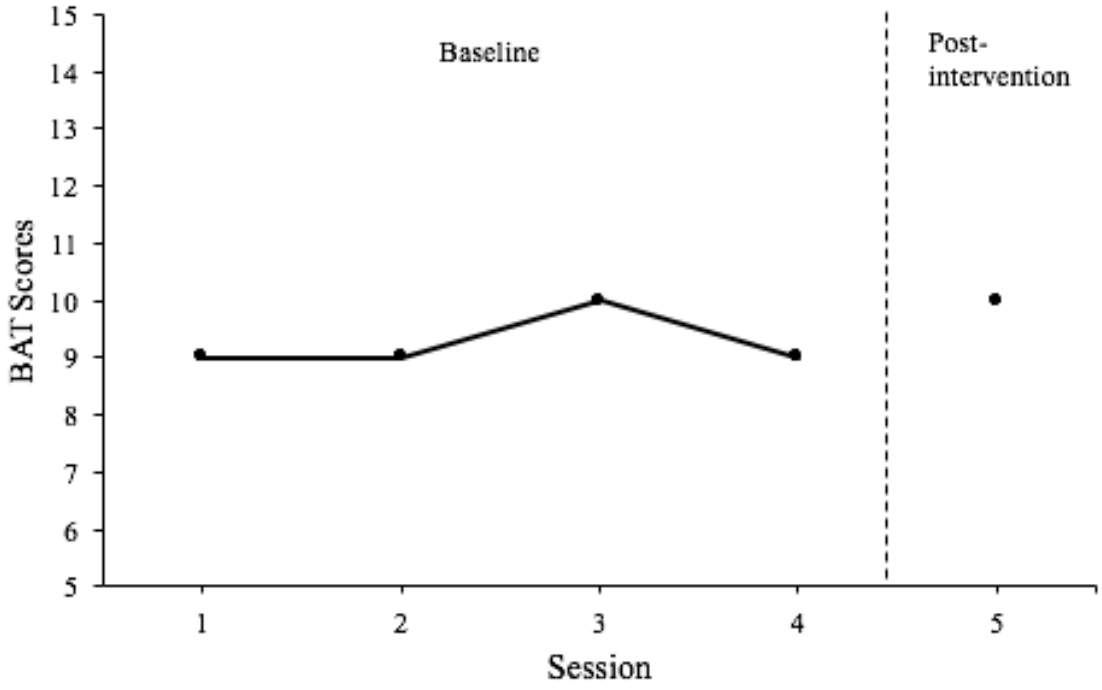

Figure 7. Betty's Behavioural Avoidance Test scores for baseline and post-intervention sessions.

The first BAT took Betty 2 minutes and 37 seconds to complete. The following BATs were completed at a much faster rate with the fastest time recorded at 36 seconds. The time of each BAT completion is displayed in Table 7.

Table 7
Completion Times for Betty's Behavioural Avoidance Test.

Session	Time
1	2 minutes 37 seconds
2	1 minute 30 seconds
3	1 minute 35 seconds
4	52 seconds
5	36 seconds

Betty's heart rate data is displayed in Figure 8. For each session, the mean heart rate value is displayed for each anxiety measure, for resting periods, and during the VSM viewing times. Betty's heart rate levels were stable across all phases. Based on the normative heart rate values mentioned above, Betty's heart rate was never out of the normal range as her heart rate ranged from 92 – 119 beats per minute. The lowest heart

rate level of 92 beats per minute occurred in the second baseline session during the resting period. The highest heart rate level of 119 beats per minute occurred during the final intervention session also during the resting period. Therefore, there was no decrease in heart rate levels that could be attributed to the intervention. The differences in heart rate could therefore be due to individual factors. This is discussed further in the discussion chapter.

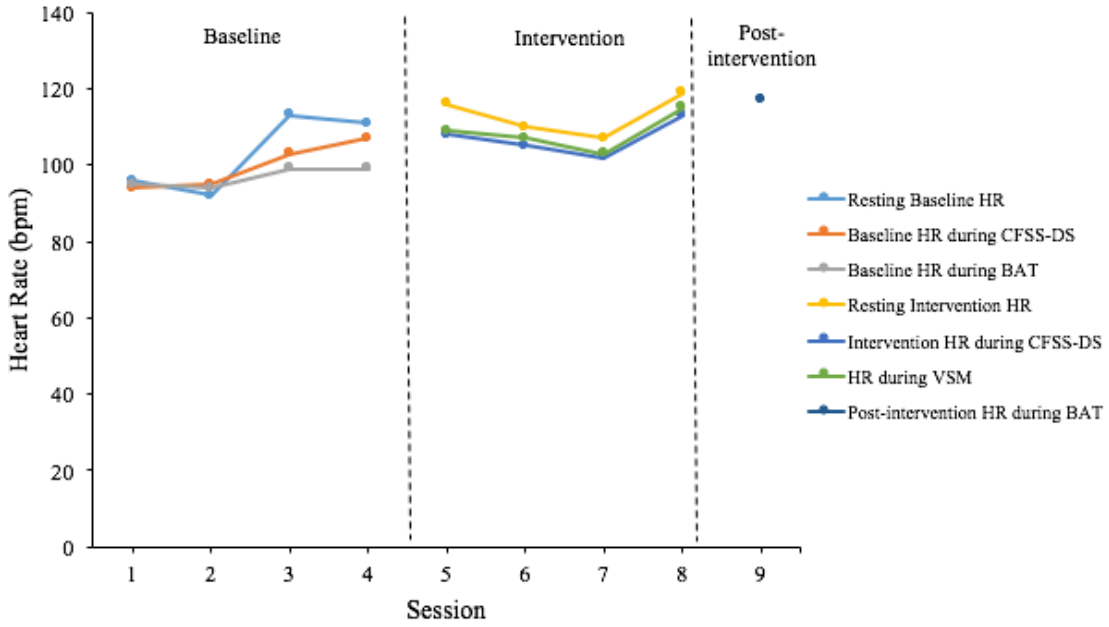

Figure 8. Betty's mean heart rate scores in beats per minute during baseline, intervention, and post-intervention sessions.

At the completion of the intervention Betty no longer met the criteria for mild dental anxiety. Her self-report scores were below the 32-50 range and her BAT scores were low throughout the study. The self-report results suggest that the intervention was able to reduce Betty's mild dental anxiety. Her heart rate values did not reach abnormal levels, which suggests she was not overly distressed during the sessions or when discussing dental situations. Betty's heart rate levels and BAT scores did not appear to change from the intervention.

Chapter 4

DISCUSSION

Dental anxiety is an issue for some children. This anxiety could be present for a number of reasons, such as the pain associated with previous dental work, the injections, the general uncomfortableness of dental treatment, or the fear of the unknown. The current study aimed to reduce children's dental anxiety through an intervention using point-of-view video self-modelling. The purpose of this intervention was to help children learn what happens during a typical dental appointment and to minimise the fear of the unknown that children often feel when in dental settings. Reducing dental anxiety is necessary because it can encourage children to continue visiting the dentist and promote their oral health.

The researcher met with the children for four baseline sessions, four intervention sessions, and one post-intervention session. Self-reported dental anxiety was recorded using the CFSS-DS, behavioural measurements were taken using the BAT, and heart rate data was recorded through a pulse oximeter. The children were asked to view their individual VSM four times over the two-week intervention. The children were superimposed into the VSM to help them believe they were watching themselves and help increase their confidence in future dental visits. The main findings of this study are explained below.

Main Findings

The researcher recruited two children who were seven-years-old. The researcher's intentions were to originally have six participants, however, there was a lack of interest from schools and from families to participate. Two schools out of the eight schools approached by the researcher agreed to work with her. Out of the 44 screening questionnaires that were sent out to students, only 10 were returned by the children to

their teacher. Out of the 10 screening questionnaires returned, five children were eligible, however, only two children and their families agreed to participate. There was the opportunity to have more participants but the small number of responses to the initial screening questionnaire meant recruitment was limited. Because of the small sample size, group data analysis was not possible. Each participant's results will therefore be discussed separately in the next two sections.

Sally. A decrease in dental anxiety was illustrated from Sally's self-report data. Her scores at the follow-up session decreased from the initial screening test. Her self-report scores were originally in the mild dental anxiety range, but after the intervention, her scores decreased to 26 on the CFSS-DS which is under the cut-off score for mild dental anxiety. Sally's scores on the BAT assessment were also lower after the intervention as she rated her feelings as "not afraid" to each image at the last meeting. Her heart rate data was variable and therefore no trend in heart rate could be deciphered. This overall result supports the hypothesis that dental anxiety could be reduced through a VSM intervention.

Betty. A decrease in dental anxiety was also illustrated from Betty's self-report data. Her self-report scores were originally in the mild dental anxiety range but decreased to below this level after the intervention to a score of 26 on the CFSS-DS. This result also supports the hypothesis that dental anxiety can be reduced through a VSM intervention. Betty's BAT scores and heart rate did not appear to change due to the intervention.

Creation of VSM intervention. The researcher was able to easily create the children's VSM using a video camera and iMovie. It was also simple to use the green screen with the children at their school as it only required pinning up the green canvas material (green screen) and setting up the camera with a tripod. The children were then

filmed in front of the green screen for one minute, which did not trigger their dental anxiety. Because the same video footage of the dentist was used for both participants, once that footage was arranged, it was simple to combine the footage of the dentist and the footage of the participants. The footage of the participants was placed on top of the footage of the dental clinic. Using iMovie, the chroma key colour (green screen) was then replaced with the dental clinic footage. This resulted in video footage that depicted the participant as if they were standing in the waiting room of the dental clinic. No other editing or graphic effects for the video footage was required. This suggests this intervention is easy to replicate and it does not require extensive computer skills or expensive equipment. Creating this intervention also did not create anxiety or distress for the children.

Processes in VSM

While the intervention was successful for the two children, it is also important to discuss why the intervention may have been effective. One reason could be related to the repeated exposure to dental stimuli. The VSM facilitated this repeated exposure since both children watched their 3 minute and 22 second video four times in two weeks. They therefore could have become familiar with seeing the dentist, the dental environment, and the dental tools which may have led to desensitisation of the dental visit experience. This in itself could have decreased the two children's anxiety levels. Repeated exposure is also something commonly used in CBT, however, Dowrick (2012) argues that VSM interventions can be more efficient compared to CBT sessions even though both have repeated exposure processes involved. As previously mentioned, children in a study by Kahn et al. (1990) experienced more behavioural change after 21 minutes of viewing time of a VSM compared to other children who had 30 hours of CBT sessions. The repeated exposure process was something that did not occur in some

of the previous research on modelling. Melamed et al. (1975a) and Melamed et al. (1978) had their participants view the modelling video one time before their dental appointments. Despite this, one viewing of the modelling video was able to decrease anxiety levels for the participants in these two studies. The participants, however, were not given the opportunity to view the modelling video more than once so it is unknown if additional viewings would have decreased anxiety levels further.

A second reason the intervention was effective could be related to conditioning factors. The children watched the VSM with the researcher in a classroom at their school. This was a familiar environment for the children and it may not have provoked anxiety. This non-stressful environment was then paired with the VSM of the dental appointment possibly resulting in conditioning processes similar to Pavlov's classical conditioning research. The children therefore were able to view the dental stimuli (that may have previously caused them distress) in a safe way. Because it was purely visual, and they felt safe in their viewing environment, this may have allowed them to feel more comfortable viewing dental stimuli in general. As the children appeared comfortable, their concentration on the VSM and comprehension of the information may have also increased, thus reducing their anxiety. The school setting for this intervention was therefore a strength in this study. This setting was also different to previous research. In the study by Mungara et al. (2013) the participants viewed their modelling video at the dental clinic immediately before their dental appointment. The intervention performed by Mungara et al. (2013) was still effective at reducing dental anxiety with this location for the intervention. Despite this fact, children with dental anxiety may be more comfortable if they have the opportunity to view their intervention in a safe environment and in an environment that does not provoke their anxiety.

A third reason for the VSM's effectiveness could be due to cognitive rehearsing. This is similar to repeated exposure, however, with cognitive rehearsal, the participant feels more capable to respond to the feared situation themselves because they have seen what is going to happen from viewing the VSM. The structure of the VSM in a way could have provided the children with a cognitive plan for what going to the dentist involved, which may have reduced their anxiety. Cognitive rehearsal could have also occurred in the previous research conducted by Melamed et al. (1975a), Melamed et al. (1978) and Mungara et al. (2013) but this was not discussed in their results. Participants in these studies and in the current study were shown video footage of a dental appointment which could have then led to the participants developing their own cognitive plan for visiting the dentist.

A fourth reason the VSM was effective could be due to the way information was presented in the video. Jaaniste et al. (2007) explained that preparatory information for children needs to be clear and age appropriate. The information in this VSM was stated clearly by the dentist and he spoke directly to the child viewing the VSM. He also used analogies to explain procedures such as describing the suction tool as similar to a vacuum cleaner to help clean up the water. This was information the two seven-year-old children could comprehend. Anderson and Masur (1983) also state that preparatory information needs to include sensory information. This VSM demonstrated the sounds of the suction tool and the hand drills which may have helped desensitise the children to the loud noises common to dental visits.

The intervention may also have been effective because the children found the VSM intervention enjoyable. The feedback from the children was positive and they were able to identify with the VSM. In Sally's feedback, she reported that she thought of herself as actually being with the dentist in the video. She commented on the

patient's finger in the video when it was visible and she stated "look at my finger". Sally also asked "why do I have to wear the safety glasses?" This showed she felt she was the person in the video.

Betty also commented on how realistic the video felt for her. She excitedly took the video home to her family and watched it with them. Betty's mother reported that Betty talked about feeling as though she was really going through a dental appointment. In the follow-up meeting with Betty, the researcher showed her a graph of her results that depicted the decrease in her anxiety levels post intervention. The researcher asked Betty why she thought the decrease occurred. Betty responded that she "felt better after watching the video". Her comments about the intervention were positive as she stated that the video was helpful, she thought the dentist was really nice, and she felt comfortable watching the video.

Betty's mother wanted her to participate in this study because she saw how difficult visiting the dentist had been in the past for Betty. Her mother mentioned it would make things much easier if Betty could cope better with no anxiety. This information indicated that a child's dental anxiety can have an impact on parents as well as the child. The parents often try to help the child through their anxiety by providing support which can be challenging for a parent and can also increase parents' anxiety levels (Jaaniste et al., 2007).

In the follow-up meeting with Betty, the researcher asked how her recent dentist visit went. Betty had one filling placed two weeks after the intervention finished which required a local anaesthetic injection. Betty said she was still scared before the appointment and at the start of the procedure. Betty's parents informed the dentist about Betty's dental anxiety before the appointment. Her dentist therefore acknowledged her anxiety and he explained everything he was going to do before he began. Betty said she

did not like surprises so the dentist explained when he would spray the water in her mouth or use the drill. She reported that she didn't feel any pain throughout the appointment. When Betty was asked how she coped with the drill, she said it wasn't comfortable but she was able to not feel too anxious. She reported she found the loud noises of the drill and suction very annoying and she didn't like the feeling of being numb after the appointment. After the dental appointment, Betty reported "that wasn't as bad as I thought".

The fact that Betty was able to cope during a dental appointment was an improvement from before the VSM intervention. Betty's mother stated that Betty would often cry when at previous dental appointments. Betty was still feeling anxious at the beginning of her post-intervention dental appointment but she consented to the appointment and treatment. This finding suggests that the VSM intervention gave Betty enough confidence to be able to go to the dentist and sit through the procedure without crying or feeling distressed. Since she was able to have a trauma-free dental experience, this may decrease her anxiety levels for future appointments. She stated that the appointment was not as bad as expected which indicated she had some anxious thoughts prior to her appointment. Betty, at the end of the intervention, was able to realise these previous thoughts were not true and did not materialise.

Limitations

There were some limitations to this study. These included the questionnaire, the CFSS-DS, the possibility of parent influence, practice effects, the heart rate measurement, and the number of participants.

Questionnaire. The first limitation of this study was the children's difficulty in understanding the CFSS-DS measure. The questions asked the children to rate how afraid they were of certain dental situations. The children could have instead understood

the question as meaning how much they disliked the situation. The researcher thought this may be an issue because of the way the children reacted to the questions. When asked, “How do you feel when the dentist is drilling your teeth”, Sally answered, “very afraid”. To gain insight into this response, the researcher then asked “why so?”. Sally said that it felt funny and she didn’t like it. This wasn’t a fearful response but rather a dislike of the situation. Some children may therefore be able to go through a dental appointment and be unhappy about the noise or the instruments but not be anxious or afraid of the actual situation. The CFSS-DS measure therefore was not able to help the children decipher the difference between dislike and fear.

The response scale of the questionnaire could have also been confusing to the children. There were five response choices, from “not afraid at all” to “very afraid”. On reflection, there may have been too much variety in probable responses thus the children may have had difficulty deciphering how they exactly felt. The children were also seven-years-old and this scale may have been better suited to older participants.

Parent influence. A second limitation was the possibility that the parents changed the children’s responses or helped them respond to the CFSS-DS for the initial screening measure. The screening measure was completed at home and the parents helped the children read and understand it. For the two children in this study, the initial score on the screening test was higher than their score at the first baseline meeting. The researcher helped the children to understand the questionnaire at the baseline meetings but the questions were exactly the same as the screening test that was completed at home. The difference between the initial screening score and the first baseline score could possibly be due to parental influence since the questionnaires in the two meetings were the same. The only difference between the screening meeting and the baseline meeting was the presence of the parent in the former.

Parents and children may have different recollections about the children's previous dental appointments and therefore parents could have corrected their children's responses if they felt they were inaccurate. Parents may have also mentioned their own dental experiences to their children that then could have impacted on their child's responses. Parents could have also filled in the questionnaire for their children. This difference between parent- and child-report has been previously discussed by Naithani and Viswanath (2014). These researchers found that parent report of children's dental anxiety was higher than the children's self-reported dental anxiety. It was suggested that parents tend to exaggerate their children's anxiety level. This could have occurred in this study when parents helped their children complete the questionnaire. Alternatively, children could be underestimating their own anxiety levels thus this difference in responses could be explained.

Practice effects. An issue with single-case design research is that participants complete the same measurements several times over the course of a study. This situation can mean participants become familiar with the measures and this familiarity provides practice effects on the measures. In this study, the children completed the BAT a total of five times and the CFSS-DS, a total of 10 times. The findings illustrated that the two children completed the BAT faster each time they completed it. This finding suggests that practice effects occurred as the children did not require the same amount of processing time to complete the test over the time of the study. Although processing and completion time decreased, the children's scores on the BAT were stable during the baseline sessions. This finding suggests the children may have comprehended the questions in the same way each time they completed the measure even though the processing time decreased. Alternatively, the children could have tried to remember

how they responded in the previous session and they may have tried to respond in the same way each time.

Heart rate. The heart rate data was not a reliable measure for this study as it was variable for both children regardless of what stimuli the children were viewing and therefore no trend was apparent. One possible reason for the fluctuation in heart rate data was that the meetings with both the children were always scheduled directly after morning tea break. The heart rate could therefore be attributed to the high arousal from the break and not the dental stimuli. Food intake and physical activity could have also influenced the heart rate data. The children may have consumed different types of food and they may have been doing different types of physical activities during their break time, thus these factors may have influenced their heart rate and caused the difference between sessions. Furthermore, Sally also found it difficult to keep her hand still during the nine sessions which also may have influenced the pulse oximeter's readings. Betty was able to keep her hand still for the heart rate readings so this did not appear to be a factor which influenced her findings as it was with Sally.

Number of participants. Due to the difficulty in recruiting participants, only two seven-year-old girls participated. This small number of participants meant one could not determine if the intervention could be effective for other children. Both participants were female, therefore this study cannot determine if the intervention would be successful for males as well. Both participants were also of Pakeha/European descent, as well as the dentist depicted in the VSM, therefore it is unknown as to whether children of different ethnic backgrounds would respond in a similar way as Sally and Betty.

Comparison to Other Literature

Since no other study has used this type of point-of-view VSM there is little literature to compare the current findings with. The studies reviewed in the introduction used peer-modelling instead of video self-modelling. All these studies found that peer-modelling helped to reduce dental anxiety in children. Melamed et al. (1978) found that video peer-modelling was less frightening than a dental video demonstration suggesting that children were comforted more by seeing someone else go through a dental appointment than viewing the dentist's explanation. This finding contrasts with the current study because the point-of-view VSM was more similar to Melamed et al.'s (1978) demonstration video than it was to their modelling video as it mostly showed the dentist explaining his tools. The children in this study were not provided with footage of a calm dental patient, yet the point-of-view VSM was still successful in reducing dental anxiety. This finding suggests that a model may not always be needed to reduce dental anxiety. This study, however, did not have a comparison group to confirm this type of VSM is more effective than other types of videos or interventions.

Dowrick's research with VSM suggests that learning occurs at rapid speed when the desired behaviour is observed, with learning occurring faster in VSM than in peer modelling because the behaviour is also performed by the viewer (Dowrick, 2012). The current study was unique because it deviated from Dowrick's work as this VSM did not physically show the child's behaviour in the dental chair. Dowrick would argue that this type of VSM would not be successful because it lacked the depiction of the child performing the desired behaviour as the viewer was only seeing the dentist and related dental tools. The viewer was told, however, that this was their visit to the dentist and the dentist was talking to them. Only the beginning and end of the VSM showed the child standing in the waiting room of the clinic. The way both children related to the VSM

suggested they strongly believed they were in the VSM. This belief may have been enough to initiate the same learning effects as in traditional forms of VSM. If children thought it was actually them going through a dental appointment this may have increased their confidence and concentration on the video, thus it was able to decrease their dental anxiety.

Many of the peer-modelling studies also used the CFSS-DS as a dental anxiety measure as did the study conducted by Mungara et al. (2013). These studies found that children of the ages of five and nine years were most anxious about injections and choking when at the dentist. This finding is similar to the current study as Sally rated injections and choking as her most feared dental situations. Betty also rated injections as her most feared situation as well as visiting the general hospital. The ratings on injections and choking in the study by Mungara et al. (2013) did decrease after the children underwent the modelling intervention but this finding contrasts with the current study as the VSM intervention did not decrease Sally's and Betty's ratings on these situations. This difference could be due to the types of interventions shown to the children as the intervention in Mungara et al. (2013) depicted a treatment appointment so the injection was shown and the possibility of choking was addressed. These situations were not covered in the current VSM intervention.

Siegel and Peterson (1980) found that teaching children self-control coping skills was just as effective in reducing dental anxiety as providing sensory and procedural information to the children. The VSM intervention used in this study was similar to the sensory and procedural information because both types of intervention demonstrated to the participants what dental tools looked like, their sound, their purpose, with the dentist also narrating what he was doing. The difference was that this VSM intervention did not explain how to cognitively respond to the dental procedure as done in the self-control

coping group of Siegel and Peterson's (1980) study. The sensory information group, the self-control coping group, and the participants in this study all experienced decreases in dental anxiety. When receiving sensory information, children did not have to learn a new skill as was required in the self-control coping techniques. Sensory and procedural information may therefore be important to provide in dental anxiety interventions as it may be easier for children to understand. The children do not necessarily need to learn how to self-manage their anxiety if it can be decreased through other techniques.

Challenges Faced

There have been a number of challenges faced during the course of this study. Some challenges, such as recruitment and the screening procedure delayed the progression of the study and led to the small number of participants. Finding the appropriate behavioural measure was also difficult. These challenges will be discussed in more detail below.

Recruitment. One primary school did not want to have their students participate in the study. They stated that the school did not have a lot to do with the children's dental visits and they didn't feel the study was relevant to them as the children had access to a fast dental check-up in a mobile van once a year and then parents took them for treatment if needed. It was therefore difficult to find schools that would agree to have their students participate because dental anxiety did not appear to be an issue for them. This is an issue because the school may be unaware that a child may be very anxious about their dental visits and this anxiousness may impact on their academic work and peer interaction prior to their dental appointment. The issue of dental anxiety may therefore be present in school children but it appears to go unreported.

It was also difficult to get parents interested in the study as many parents thought dental visits were not a problem for their child. For those children that did not need

dental treatment, but still had anxiety, their parents may not recognise their anxiety because they are never present during their child's dental check-ups at school. If their child's school does not recognise that dental visits may be an issue for some children, the children may go through several years at school before this issue becomes apparent to the family. When two schools approved the researcher to work with them there were further challenges with the screening methodology.

Screening. When planning the screening procedure, the researcher proposed to screen a classroom of children with the CFSS-DS. All children in the class would have been given the opportunity to write down how they felt about the dentist and the paperwork would therefore not get lost in transition from school to home. This type of screening procedure was not used because it was considered unethical to have children fill out a personal questionnaire at school as it may have caused distress to some children and a parent supervisor was therefore required.

An alternative screening procedure was devised so that the dental screening questionnaires were distributed to the children at their school but the questionnaire was completed at the child's home with their parents. Out of the 44 screening questionnaires that were sent home, 11 were returned. This small response number was another reason why recruitment was so difficult. A higher response rate may have occurred if children completed the screening questionnaire in their classroom.

Behavioural measure. Another challenge faced by the researcher was trying to find the appropriate behavioural measure for this study. Unfortunately, due to ethical restrictions, the researcher was not able to attend a dental appointment with the children and therefore could not measure their direct behaviour at a dental clinic using the traditional Behavioural Avoidance Test (Bernstein & Nietzel, 1973). A modified version of the Behavioural Avoidance Test was therefore created to measure the

children's' behaviour towards dental visits. The modified behavioural avoidance test included images only of dental stimuli and the children completed this test at their school with the researcher. This behavioural measure indicated the intervention was effective for Sally only.

The ultimate test in determining if anxiety has decreased is for the children to attempt to perform the feared task. This was not possible in this study and it is therefore difficult to determine if this VSM intervention helped these two children with their anxiety without seeing how they behaved in a dental appointment before and after the intervention. Fortunately, Betty had a dental appointment shortly after the intervention ended and Betty's behaviour post follow-up suggested the intervention decreased her anxiety, however, this was based on self-report from Betty and her mother as no measure of anxiety was taken in her dental appointment.

Implications

The findings of this study suggest that two seven-year-old children each had different aspects that they were anxious about when visiting the dentist. Sally was most anxious about choking and the injection while Betty was most anxious about hospitals and injections. While injections were a common fear between the two children they differed on their ratings of choking and going to the hospital. These findings suggest that dental anxiety could be displayed differently in each individual and that interventions may therefore need to tailor to the individual's needs and target the specific aspect of dentistry they fear. In the current study, the same video footage of the dentist was used for each child. This did not allow the researcher to adjust the video according to the child's individual needs. For example, Sally was most anxious about choking and the anaesthetic injection when visiting the dentist, however, the VSM did not depict the dentist giving an injection nor did it discuss the risk of choking. The

VSM may have been more effective for Sally if the researcher had included the topics of injections and choking to her VSM. The other modelling literature also did not individualise the dental video for the participants (Melamed et al., 1975a; Melamed et al., 1978; Mungara et al., 2013). These researchers created one peer-modelling video intervention and showed this to all participants in the study. Due to time restrictions in the previous research and in the current study, the video intervention could not be tailored to include specifics for individuals. Despite this fact, the video intervention still provided valuable information to the participants and appeared to decrease their dental anxiety.

The findings of this study indicate that for these two children preparing themselves prior to their dental visits was beneficial. Some children may not have received any type of preparatory information from their parents before visiting the dentist because parents fear this may frighten their child (Jaaniste et al., 2007). This lack of action could set the child up for disappointment because dentistry can be uncomfortable, it can hurt, and the child may become surprised if something they didn't expect occurs. Some parents may also exaggerate their description of a dental visit and this may frighten the child instead of preparing them for the visit. These may be parents that have had negative dental experiences themselves. The child may then go to their dental visit with the fear that everything is going to hurt because of their parents' comments. This way of developing dental anxiety is referred to as acquisition through instruction/information (Ost, 1987). Ideally, there needs to be a middle ground where children understand what is going to occur and they are made aware that there may be some discomfort (Jaaniste et al., 2007). Even though the children had mild dental anxiety in this study, their feedback about the VSM intervention stated they felt comfortable watching the video and the dentist in the video did not frighten them. This

finding suggests that young children are able to cope with preparatory information if it is presented in an informative, positive and truthful way. The child is then better equipped to cope with their dental visit because they know what to expect.

As mentioned above, the researcher had difficulty finding schools and parents that were interested in the study. Both parents and teachers felt that the intervention would not be beneficial to their children/students. This could be because they felt dental anxiety was not an issue for their children/students. This finding implies that dental anxiety may not be something that parents and schools are overly concerned about. Despite anxiety levels, providing information to children should be prioritised as it could help children to understand what a dental visit entails. As most dental check-up appointments occur at school in mobile vans it would appear to be beneficial for teachers to use this time to educate children about the importance of going to the dentist and dental care (St Leger, 1999). A short lesson preparing children for the check-up and teaching them oral health may make the dental visit process easier for children and could prevent anxiety from developing. Health education in schools has increased since the 1980s, however, as the results of this small study suggest, there still appears to be the need to improve and expand the programme (St Leger, 1999). St Leger (1999) also stated that measuring the effectiveness of dental health education programmes in schools can be difficult because of confounding factors such as individual home environments and fluoridisation of the water supply. The effectiveness of health education in schools therefore needs further investigation. The next section discusses future research in this area of dental education with young children.

Future Research

Providing information to children about dentistry and dental appointments could be an important part of preventing dental anxiety. The VSM intervention used in this

study could also be used as an educational film for children to inform them about visiting the dentist. A VSM could therefore prepare children for their dental visits by showing them what will occur and it will teach them why the dentist has to check their teeth. If children are shown this type of video intervention at home with their parents or at school before their first dental visit it could minimise their initial anxiety and it could potentially prevent negative dental experiences that could lead to dental anxiety. Future research could focus on measuring dental anxiety in children before their first dental visit. These children could be shown a similar preparatory video and then have their dental visit. Their anxiety could then be measured pre and post their visit to determine if change occurred. It may also be beneficial to interview the children about their visit to determine if negative experiences still occurred.

Future research could also compare this point-of-view VSM with an original VSM intervention. An original VSM intervention refers to a video that shows the anxious child undergoing the entire dental appointment. This is the type of VSM intervention described by Dowrick (2012) where the viewer and the model are the same person. No study to date has been able to video a child with dental anxiety throughout a dental appointment to use for VSM. Comparing a VSM with a point-of-view VSM would help to determine if a child would benefit more from seeing themselves with the dentist or from viewing the dental appointment from the point-of-view film as in this study.

If this study were to be replicated it would be beneficial to perform a functional behavioural assessment with the child before the VSM intervention was created. This would reveal what the function of the dental anxiety/fear was and could guide the creation of a function-based VSM. If the VSM is able to focus purely on the child's

individual anxiety/fears the VSM intervention may be more effective as there would be less irrelevant information that could loose the child's interest in the VSM.

Conclusion

In conclusion, dental anxiety appears to involve a complex range of emotions that are experienced differently by individuals. Dental visits are extremely important for children aged seven years old because their permanent adult teeth are growing in. These teeth will stay with them for their adult life and proper care is required to ensure they stay healthy. A point-of-view VSM is one intervention that has been able to reduce dental anxiety to low levels in two children aged seven years old. This type of VSM provides a positive and non-intrusive way to educate children about what occurs during a typical dentist visit and to help them through some of their anxiety/fear of going to the dentist. It appears from these findings that individualising the VSM interventions may increase its effectiveness. It is also important to choose appropriate measures and to choose a variety of measures for a thorough evaluation of effectiveness.

Parents, teachers, and health-care professionals should recognise and respond to children's dental anxiety early as early intervention is the best way to address children's anxiety and prevent further dental issues from developing. The findings of this study appear to support the use of a VSM intervention to decrease anxiety of dental visits in two children.

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Appendix A

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: 2015/07/ERHEC

3 September 2015

Jessica Andronico
School of Health Sciences
UNIVERSITY OF CANTERBURY

Dear Jessica

Thank you for your request for an amendment to your research proposal "Reducing dental anxiety in children through video self-modelling" as outlined in your email dated 24 August 2015. I am pleased to advise that this request has been considered and approved by the Educational Research Human Ethics Committee.

Please note that should circumstances relevant to this current application change you are required to reapply for ethical approval.

If you have any questions regarding this approval, please advise.

We wish you well for your continuing research.

Yours sincerely

Nicola Surtees
Chair
Educational Research Human Ethics Committee

"Please note that Ethical Approval and/or Clearance relates only to the ethical elements of the relationship between the researcher, research participants and other stakeholders. The granting of approval or clearance by the Ethical Clearance Committee should not be interpreted as comment on the methodology, legality, value or any other matters relating to this research."

F E S

Appendix B

School of Health Science

Jessica Andronico

Telephone:

Email:

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling
Information Sheet for Principals

Dear (NAME),

My name is Jessica Andronico and I am undertaking my Master of Arts thesis project at the University of Canterbury. My interest is with children with dental anxiety and I am interested to see if video self-modelling would help reduce children's dental anxiety. Video self-modelling is a type of intervention that shows the individual in a video undergoing simulated procedures of a dental appointment.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee.

I would like to ask your permission to undertake the following:

1. To contact the teacher to ask for their involvement
2. To contact and screen your students in one Year 2 class to determine their level of dental anxiety
3. To invite the eligible students and their parents/guardians to participate in this study

If your students participate in my study, this will involve the following two phases:

Phase 1: Screening

1. The children of one class will be asked to participate in a screening questionnaire. The children will take home an envelope to their parents/guardians with information sheets, consent forms, and the screening questionnaire to ask permission for their child's involvement. Only those children whose parents/guardians agree to be screened will undertake the questionnaire. The screening measure will be completed at the child's home and administered by their parent/guardian. There are 15 questions, which will take roughly 20 minutes. The child will be asked to rate on a likert scale represented by cartoon faces how they feel about going to the dentist and related dental procedures/equipment. The questionnaire is called the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS). Once

completed, the survey will be returned to the classroom in a sealed envelope where I will pick it up.

If the results of the above questionnaire demonstrate a mild or moderate level of dental anxiety, those children are eligible for the video self-model intervention. This project can only take six students, so if there are more than six eligible students, a random selection (name out of a hat) will take place. The parents/guardians of 1) the eligible children that do not make it into the study, and 2) the children who score in the high dental anxiety range, will be given a letter of thanks, their child's score from the screening questionnaire, and be provided with a handout with a list of appropriate psychological services that work in the area of dental anxiety.

Phase 2: Video Self-Model Intervention for six eligible children

1. The selected children for the intervention and their families will be provided an information and consent form explaining their child has been invited to the intervention stage of the project.

2. After consent has been given, and to make the children's video self-model footage, the participating children will be videoed in front of a green screen in order to create their video self-model dental intervention. This will require the children to stand by the green screen and say, "this is me". This will be done at school and at a time that suits the children and the teacher.

3. To record baseline measures, four meetings over four days will be arranged with each of the identified children at school. This will be at a time that suits the children and the teacher. A room will be requested from the teacher for this meeting. The children will be asked to complete a questionnaire and rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light, while having their heart rate measured. This is done with a pulse oximeter, which is a small clip-shaped machine that is placed on their fingertip. This will not hurt. For the purposes of accurate data matching, I will video the children during these measurements. Each meeting will take no more than 10 minutes.

4. The children will then watch their video self-model intervention four times over the following four weeks. I will schedule a meeting with each child at school for the intervention viewings. This will be at a time that suits the children and the teacher. Each meeting will take no more than 10 minutes, where the children will watch their video self-model intervention, have their heart rate measured, and then I will administer a questionnaire. For measurement purposes only, I will video the children during the intervention viewing and heart rate measure.

5. A final meeting will be organised to record a post-intervention measure. The children will be asked to rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light.

6. A follow-up questionnaire will be mailed to the child's home two weeks after the intervention. They will be asked to complete it and mail it back to me in a paid postage envelope. This data will be used as the child's final anxiety level and will provide information about whether the intervention effects last over time.

Participation in this study is voluntary and the selected children can withdraw at any stage. If a child does participate but withdraws during the process, I will try my best to remove all information relating to the child, given that this is possible.

I will take care to ensure the anonymity of participants in publications of the findings. The children who participate in this study will be given code names. The school will not be identified. Anonymity of the child participants cannot be fully guaranteed as other children in their class or school may notice the children are in the study.

I will take particular care to ensure the confidentiality of all data gathered for this study. Access to the collected data will be restricted to my supervisors and myself. During the study, all information will be kept in a locked file cabinet or digitally with password protected documents. A copy of the children's video self-model footage will be given to the families to keep. Following the study, all the data will be securely stored in password protected facilities and locked storage at the University of Canterbury for five years. It will then be destroyed. The children's video footage will not be used for any presentations.

The results of the study will be used for my Master's thesis and you will be given a report on the study. My thesis will then become a public document on the University of Canterbury Library website, however, the school, teachers, parents/guardians, and the children will not be identified in any way.

Participation in this study may involve psychological risks. The children may become anxious when watching the video self-model intervention or during questionnaires on dental anxiety. If the children feel uncomfortable, they can withdraw from the study at any time and will not be asked to finish any task they may be doing. There will be no form of pressure or obligation for the child to complete the tasks if they do not want to.

If you have any questions or concerns, please contact my supervisor or myself. Complaints may be addressed to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, Email: human-ethics@canterbury.ac.nz.

If you understand this information and are happy to proceed with this study taking place, please complete the consent form and return it to me via the postage paid envelope provided by (date to be decided).

Thank you.

Kind regards,

Jessica Andronico
Master's Candidate

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix C

School of Health Science

Jessica Andronico
Telephone:
Email:

Reducing Dental Anxiety in Children through Video Self-Modelling
Consent Form for Principals

Please tick each box

☐ I have been given a full explanation of Jessica's research project and I have been given time to ask questions.

☐ I understand what the study involves and what will be required from the students, the teachers and the board of trustees. I give permission for the Year 2 students to participate.

☐ I understand that the students can withdraw at any time with no consequence.

☐ I understand that all information about the students, the school, the teachers, and the board of trustees will be kept confidential, be kept in a safe and secure place at the University of Canterbury and will be destroyed 5 years after the study. Any reports written and published will not identify the students, the school, the teachers, or the board of trustees.

☐ I understand that the thesis will be publicly accessible through the University of Canterbury's Library website.

☐ I know that I will receive a report of the results from the study and have provided my email below.

☐ I understand that the University of Canterbury Educational Research Human Ethics Committee has approved this study.

☐ I know that if I need further information, I can contact Jessica or her supervisor, Dr Gaye Tyler-Merrick.

☐ If I want to make a complaint, I know I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee.

By signing this form, I consent to the above.

School's name: _____

Member's name: _____

Signed by member: _____

Date: _____

Email address for report to be sent: _____

Appendix D

School of Health Science

Jessica Andronico

Telephone:

Email:

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling
Information Sheet for Teachers of Year 2 Students

Dear (NAME),

My name is Jessica Andronico and I am undertaking my Master of Arts thesis project at the University of Canterbury. My interest is with children with dental anxiety and I am interested to see if video self-modelling would help reduce children's dental anxiety. Video self-modelling is a type of intervention that shows the individual in a video undergoing simulated procedures of a dental appointment.

This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee.

I would like to ask your permission to undertake the following:

1. To contact parents/guardians and then screen your class to determine their level of dental anxiety
2. To collect the parent/guardian and child consent forms from your classroom
3. To use a space in your classroom for the six eligible children to make and watch their video self-model intervention

If your students participate in my study, this will involve the following two phases:

Phase 1: Screening

1. The children in your class will be asked to participate in a screening questionnaire. The children will take home an envelope to their parents/guardians with information sheets, consent forms, and the screening questionnaire to ask permission for their child's involvement. Only those children whose parents/guardians agree to be screened will undertake the questionnaire. The screening measure will be completed at the child's home and administered by their parent/guardian. There are 15 questions, which will take roughly 20 minutes. The child will be asked to rate on a likert scale represented by cartoon faces how they feel about going to the dentist and related dental procedures/equipment. The questionnaire is called the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS). Once

completed, the survey will be returned to you in a sealed envelope where I will pick it up.

If the results of the above questionnaire demonstrate a mild or moderate level of dental anxiety, those children are eligible for the video self-model intervention. This project can only take six students, so if there are more than six eligible students, a random selection (name out of a hat) will take place. The parents/guardians of 1) the eligible children that do not make it into the study, and 2) the children who score in the high dental anxiety range, will be given a letter of thanks, their child's score from the screening questionnaire, and be provided with a handout with a list of appropriate psychological services that work in the area of dental anxiety

Phase 2: Video Self-Model Intervention for six eligible children

1. The selected children for the intervention and their families will be provided an information and consent form explaining their child has been invited to the intervention stage of the project.

2. After consent has been given, and to make the children's video self-model footage, the participating children will be videoed in front of a green screen in order to create their video self-model dental intervention. This will require the children to stand by the green screen and say, "this is me". This will be done at school and at a time that suits the children and yourself.

3. To record baseline measures, four meetings over four days will be arranged with each of the identified children at school. This will be at a time that suits the children and yourself. A room will be requested from you for this meeting. The children will be asked to complete a questionnaire and rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light, while having their heart rate measured. This is done with a pulse oximeter, which is a small clip-shaped machine that is placed on their fingertip. This will not hurt. For the purposes of accurate data matching, I will video the children during these measurements. Each meeting will take no more than 10 minutes.

4. The children will then watch their video self-model intervention four times over the following four weeks. I will schedule a meeting with each child at school for the intervention viewings. This will be at a time that suits the children and yourself. Each meeting will take no more than 10 minutes, where the children will watch their video self-model intervention and then I will administer a questionnaire and record their heart rate. For measurement purposes only, I will video the children during the intervention viewing.

5. A final meeting will be organised to record a post-intervention measure. The children will be asked to rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light.

6. A follow-up questionnaire will be mailed to the child's home two weeks after the intervention. They will be asked to complete it and mail it back to

me in a paid postage envelope provided. This data will be used as the child's final anxiety level and will provide information about whether the intervention effects last over time.

Participation in this study is voluntary and the selected children can withdraw at any stage. If a child does participate but withdraws during the process, I will try my best to remove all information relating to the child, given that this is possible.

I will take care to ensure the anonymity of participants in publications of the findings. The children who participate in this study will be given code names. The school will not be identified. Anonymity of the child participants cannot be fully guaranteed as other children in their class or school may notice the children are in the study.

I will take particular care to ensure the confidentiality of all data gathered for this study. Access to the collected data will be restricted to my supervisors and myself. During the study, all information will be kept in a locked file cabinet or digitally with password protected documents. A copy of the children's video self-model footage will be given to the families to keep. Following the study, all the data will be securely stored in password protected facilities and locked storage at the University of Canterbury for five years. It will then be destroyed. The children's video footage will not be used for any presentations.

The results of the study will be used for my Master's thesis and you will be given a report on the study. My thesis will then become a public document on the University of Canterbury Library website, however, the school, teachers, parents/guardians, and the children will not be identified in any way.

Participation in this study may involve psychological risks. The children may become anxious when watching the video self-model intervention or during questionnaires on dental anxiety. If the children feel uncomfortable, they can withdraw from the study at any time and will not be asked to finish any task they may be doing. There will be no form of pressure or obligation for the child to complete the tasks if they do not want to.

If you have any questions or concerns, please contact my supervisor or myself. Complaints may be addressed to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, Email: human-ethics@canterbury.ac.nz.

If you understand this information and are happy to proceed with this study taking place, please complete the consent form and return it to me via the postage paid envelope provided by (date to be decided).

Thank you.

Kind regards,

Jessica Andronico
Master's Candidate

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix E

School of Health Science

Jessica Andronico
Telephone:
Email:

Reducing Dental Anxiety in Children through Video Self-Modelling
Consent Form for Teachers of Year 2 Students

Please tick each box

☐ I have been given a full explanation of Jessica's research project and I have been given time to ask questions.

☐ I understand what the study involves and what will be required from my students and myself.

☐ I agree to collect the students' and their families' informed consent envelopes and communicate with Jessica about picking them up.

☐ I understand that participation in this project is voluntary.

☐ I understand that all information about my students, the school, and myself will be kept confidential, be kept in a safe and secure place at the University of Canterbury for 5 years and then will be destroyed. Any reports written and published will not identify my students, the school, or myself.

☐ I understand that the thesis will be publicly accessible through the University of Canterbury's Library website.

☐ I know that I will receive a report of the results from the study and have provided my email below.

☐ I understand that the University of Canterbury Educational Research Human Ethics Committee has approved this study.

☐ I know that if I need further information, I can contact Jessica or her supervisor, Dr Gaye Tyler-Merrick.

☐ If I want to make a complaint, I know I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee.

By signing this form, I consent to the above.

School's name: _____

Teacher's name: _____

Signed by teacher: _____

Date: _____

Email address for report to be sent: _____

Appendix F

School of Health Science
Jessica Andronico
Telephone:
Email:

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling
Information Sheet for Parents/Guardians – Phase 1: Screening Procedure

Dear (NAME),

My name is Jessica Andronico and I am undertaking my Master of Arts thesis project at the University of Canterbury. My interest is with children with dental anxiety.

To find eligible children with dental anxiety, I will use a screening questionnaire called, the Children's Fear Survey Schedule – Dental Subscale (CFSS-DS). This questionnaire has 15 questions that will ask your child how they feel about going to the dentist and the usual dental procedure. This questionnaire takes around 20 minutes. If your child scores in the mild/moderate range of dental anxiety, they are eligible for the next stage of the project. I will let you know the result of the questionnaire and talk to you further if your child is eligible. This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee.

Attached is the CFSS-DS questionnaire along with the consent forms. After you have read through these documents, and give permission your child to participate, please complete the parent/guardian consent form, read your child the child information sheet, and help your child complete the child consent form and the questionnaire. Once completed, place the completed consent forms and the questionnaire in the return envelope. Please ask your child to return this envelope to their teacher at school. The information sheets are yours to keep and have my contact details on them, should you need them.

If your child becomes upset at any time during the screening questionnaire, they do not have to continue. Participation in this study is voluntary and your child can withdraw at any stage. If you feel your child is uncomfortable, you can make the decision to stop.

I will take care to ensure the anonymity of your child's screening test result in any publications of the findings. Anonymity of your child participating cannot be fully guaranteed at school as other children in their class and school may notice your child is involved in the screening procedure. I will take particular care to ensure the confidentiality of all data gathered for this study. Access to the screening findings will be restricted to my supervisors and myself. During the study, your child's screening information will be kept in a locked file cabinet or digitally with password protected documents. Following the study, all the data will be securely stored in password

protected facilities and locked storage at the University of Canterbury for five years. It will then be destroyed.

If you have any questions or concerns, please contact my supervisor or myself. Complaints may be addressed to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, Email: human-ethics@canterbury.ac.nz.

If you understand this information and are happy for your child to participate in the dental screening questionnaire, please complete the consent forms, the questionnaire, and send it back to school with your child by (date to be decided).

Thank you.

Kind regards,

Jessica Andronico
Master's Candidate

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix G

School of Health Science

Jessica Andronico
Telephone:
Email:

Reducing Dental Anxiety in Children through Video Self-Modelling
Consent Form for Parents/Guardians – Phase 1: Screening Procedure

Please tick each box

☐ I have been given an explanation of the dental screening questionnaire my child will complete and I have been given time to ask questions.

☐ I understand what the screening questionnaire involves and have provided my email below to receive a copy of my child's results.

☐ I understand my child may be eligible to participate in this project further, should they meet the questionnaire's criteria of mild or moderate dental anxiety. Jessica will contact me if my child is eligible.

☐ I understand that all information about my child, the teachers, the school, and myself will be kept confidential, be kept in a safe and secure place at the University of Canterbury and will be destroyed 5 years after the study. Any reports written and published will not identify my child or myself.

☐ I understand that the University of Canterbury Educational Research Human Ethics Committee has approved this study.

☐ I know that if I need further information, I can contact Jessica or her supervisor, Dr Gaye Tyler-Merrick.

☐ If I want to make a complaint, I know I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee.

By signing this form, I consent to the above.
Child's name: _____

Parent's name: _____

Signed by parent: _____

Date: _____

Email address for report to be sent: _____

Appendix H

School of Health Science

Jessica Andronico

Telephone:

Email:

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling
Information Sheet for Parents/Guardians – Phase 2: Video Self-Modelling Intervention

Dear (NAME),

My name is Jessica Andronico and I am undertaking my Master of Arts thesis project at the University of Canterbury. My interest is with children with dental anxiety and I am interested to see if video self-modelling would help reduce children's dental anxiety. Video self-modelling is a type of intervention that shows the individual in a video undergoing simulated procedures of a dental appointment. This project has received ethical approval from the University of Canterbury Educational Research Human Ethics Committee.

Following your child's completion of the dental screening measure, they are eligible to continue in the study. I would therefore like to invite your child to participate in the 2nd phase of this study. This will involve the following:

1. When you and your child's consent has been provided, your child will be videoed in front of a green screen in order to create their video self-model interventions. This will require your child to stand by the green screen and say, "this is me". This will be done at school and at a time that suits your child and teacher.

2. To record baseline measures, four meetings over four days will be arranged with your child at school. This will be at a time that suits your child and teacher. A room will be requested from the teacher for this meeting. Your child will be asked to complete a questionnaire and rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light, while having their heart rate measured. This is done with a pulse oximeter, which is a small clip-shaped machine that is placed on their fingertip. This will not hurt. For the purposes of accurate data matching, I will video your child during these measurements. Each meeting will take no more than 10 minutes.

3. Your child will then get to watch their video self-model intervention four times over a few weeks. I will schedule a meeting with your child at school for the intervention viewings. This will be at a time that suits your child and teacher. When watching the video self-model, I will record their heart rate. For the

purposes of accurate data matching, I will video your child during the intervention viewings and heart rate measures. After this, I will give your child a small questionnaire. Each meeting will take no more than 10 minutes.

4. A final meeting will be organised to record a post-intervention measure. Your child will be asked to rate their feelings towards photos of dental stimuli such as, the dentist, the dental chair, and the dental light.

5. A follow-up questionnaire will be mailed to your home two weeks after the video self-model intervention. Please help your child to complete it and mail it back to me in a paid postage envelope provided. This data will be used as your child's final anxiety level and will provide information about whether the intervention effects last over time.

Participation in this study is voluntary and you can withdraw your child at any point with no consequence. If you do agree for your child to participate and withdraw at the middle or end, I will try my best to remove all information relating to you and your child, given that this is possible.

If your child participates in the video self-model intervention, they will be given a code name. I will take care to ensure the anonymity of your child in publications of the findings. The school will not be identified. Anonymity of your child cannot be fully guaranteed as other children in their class or school may notice they are in the study.

I will take particular care to ensure the confidentiality of all data gathered for this study. Access to the collected data will be restricted to my supervisors and myself. During the study, all information will be kept in a locked file cabinet or digitally with password protected documents. A copy of your child's video self-model footage will be given to your child to keep. Following the study, all the data will be securely stored in password protected facilities and locked storage at the University of Canterbury for five years. It will then be destroyed. Your child's video footage will not be used for any presentations.

The results of the study will be used for my Master's thesis and you will be given a report on the study. My thesis will then become a public document on the University of Canterbury Library website.

Participation in this study may involve psychological risks. Your child may become anxious when watching the video self-model or during the questionnaires on dental anxiety. If your child feels uncomfortable, they can withdraw from the study at any time and will not be asked to finish any task they may be doing. There will be no form of pressure or obligation for the child to complete the tasks if they do not want to. Please talk to your child about the study and if you feel they are uncomfortable, you can withdraw your child with no consequence.

If you have any questions or concerns, please contact my supervisor or myself. Complaints may be addressed to The Chair, Educational Research Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch, Email: human-ethics@canterbury.ac.nz.

If you understand this information and are happy for your child to participate in this study, please complete the consent form and return by postage paid mail by (date to be decided).

Thank you.

Kind regards,

Jessica Andronico
Master's Candidate

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix I

School of Health Science

Jessica Andronico

Telephone:

Email:

Reducing Dental Anxiety in Children through Video Self-Modelling

Consent Form for Parents/Guardians – Phase 2: Video Self-Modelling Intervention

Please tick each box

☐ I have been given a full explanation of Jessica's research project and I have been given time to ask questions.

☐ I understand what the study involves and what will be required from my child and myself. I give permission for my child to participate.

☐ I agree to help my child complete the follow-up questionnaire and mail it back to Jessica.

☐ I understand that participation in this project is voluntary and my child and I can withdraw at any time with no consequence.

☐ I understand that all information about my child, the teachers, the school, and myself will be kept confidential, be kept in a safe and secure place at the University of Canterbury and will be destroyed 5 years after the study. Any reports written and published will not identify my child, the school, or myself.

☐ I understand that the thesis will be publicly accessible through the University of Canterbury's Library website.

☐ I know that I will receive a report of the results from the study and have provided my email below.

☐ I understand that the University of Canterbury Educational Research Human Ethics Committee has approved this study.

☐ I know that if I need further information, I can contact Jessica or her supervisor, Dr Gaye Tyler-Merrick.

☐ If I want to make a complaint, I know I can contact the Chair of the University of Canterbury Educational Research Human Ethics Committee.

By signing this form, I consent to the above.

Child's name: _____

Parent's name: _____

Signed by parent: _____

Date: _____

Email address for report to be sent: _____

Appendix J

School of Health Science

Jessica Andronico
Telephone:
Email:

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling

Information Sheet for Young Children in Year 2 – Phase 1: Screening Procedure

(For the parent/guardian to read to their child)

Hello (NAME),

Jessica Andronico is doing a project at the University. She would like you to fill in a questionnaire about visiting the dentist. The questionnaire has 15 questions about how you feel when at the dentist and the dental tools they use. If you want to take part in Jessica's questionnaire, please do the following:

1) Complete the consent form with your parents/guardians
2) Complete the questionnaire with your parents/guardians
3) Take the envelope with all completed forms back to school and give to your teacher
4) Jessica will then let you know your results and if you are able to be in the next stage of the project.

If you do not want to do Jessica's questionnaire, tell your parents/guardians. You do not have to do anything you do not want to do. Everyone will be fine with this. If you feel scared at any time, please tell your parents/guardians and you can stop at any time. They will be with you during the questionnaire.

Other children may notice that you are completing this questionnaire for Jessica because you will return the envelope to your teacher.

All the questionnaires that Jessica collects will be locked away safely in an office at the university. At the end of the study, a report will be written and will be given to you and your parents/guardians. All the notes about you will be destroyed 5 years after the study. Jessica may present her study at a meeting but your name and school will not be used.

You can talk to your parents/guardians, Jessica, or your teacher if you have questions.

If you are happy to be a part of this questionnaire, your parents/guardians will help you fill out the consent form and the questionnaire.

Thank you.

Kind regards,

Jessica Andronico

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix K

School of Health Science

Jessica Andronico
Telephone:
Email:

Reducing Dental Anxiety in Children through Video Self-Modelling
Consent form for Young Children in Year 2 – Phase 1: Screening Procedure

(For the parent/guardian to read to their child)

Please tick each box

☐ I have been told about Jessica's questionnaire and I have had time to ask questions.

☐ I understand I will complete the dental questionnaire and take the questionnaire and consent forms back to school for Jessica.

☐ I understand it is my choice to do this questionnaire and I can change my mind at any time.

☐ I understand that any information about me will be kept safe and not told to anyone else except Jessica's teachers. All the information about me will be destroyed after 5 years. My parents/guardians and I will receive the results of my questionnaire.

☐ I understand that if I have any questions about the project I can ask my parents/guardians, Jessica, or my teacher.

Your name:

_____

Signed by you (or parent/guardian on behalf of you):

_____

Parent/guardian signature:

_____

Date: _____

Appendix L

School of Health Science

Jessica Andronico

Telephone:

Email:

Date:

Reducing Dental Anxiety in Children through Video Self-Modelling

Information Sheet for Young Children in Year 2 – Phase 2: Video Self-Modelling Intervention

(For the parent/guardian to read to their child)

Hello (NAME),

Jessica Andronico is doing a project at the University. She would like to work with you about visiting the dentist. If you want to be in Jessica's project, she will ask you to do the following things:

1) Jessica will video you at school so she can make a video for you about visiting the dentist. You will just have to stand in front of the camera and say, "this is me". You get to be the star in your own movie!

2) Jessica will meet with you at school four times over four days. She will ask you five questions about how you feel when at the dentist and then show you five photos from a dental clinic. The photos will be of things at a dental clinic, like the dentist, the dental chair, and the dental light. You will be asked to rate how you feel about each. At this time, she will also take your heartbeat. Jessica will measure your heartbeat with a small finger clip that sits on your finger. This will not hurt. Jessica will video you during this meeting to help her record your results.

3) Jessica will then meet with you at school four more times so you can watch the video. Jessica will also ask you to wear the finger clip to record your heartbeat again during the video. Jessica will video you again during this meeting to help her record your results. Then she will ask you five questions about how you feel when at the dentist.

4) Jessica will meet with you at school one last time and show you five photos from a dental clinic again and ask how you feel about each. The photos will be of things at a dental clinic, like the dentist, the dental chair, and the dental light.

5) Two weeks after you watched your video self-model for the last time, a questionnaire will be sent to you at home to fill in with your parent/guardian.

If you feel scared at any time and do not want to continue in Jessica's study, just tell your parents/guardians, Jessica, or your teacher.

You will be given a code name so no one will know your name, but other children may notice that you are working with Jessica because she will be at your school with you.

All the notes and movies that Jessica makes will be locked away safely in an office at the university. At the end of the study, a report will be written and will be given to you and your parents/guardians. All the notes about you will be destroyed 5 years after the study. Jessica may present her study at a meeting but your name, your school, and your video will not be used.

You can talk to your parents/guardians, Jessica, or your teacher if you have questions.

If you are happy to be a part of this project, your parents/guardians will help you fill out the consent form.

Thank you.

Kind regards,

Jessica Andronico

Primary Supervisor:

Dr Gaye Tyler-Merrick

School of Health Science

Appendix M

School of Health Science

Jessica Andronico

Telephone:

Email:

Reducing Dental Anxiety in Children through Video Self-Modelling

Consent Form for Young Children in Year 2 – Phase 2: Video Self-Modelling Intervention

(For the parent/guardian to read to their child)

Please tick each box

☐ I have been told about Jessica's project and I have had time to ask questions.

☐ I understand I will answer some questions and watch a video self-model about visiting the dentist.

☐ I understand it is my choice to be in this study and I can change my mind at any time.

☐ I understand that I will have a code name so no one will know my real name, my parents'/guardians' name, my teacher's name and what school I go to.

☐ I understand that any information about me will be kept safe and not told to anyone else except Jessica's teachers. All the information about me will be destroyed after 5 years. My parents/guardians and I will receive a report after the study has finished.

☐ I understand that if I have any questions about the project I can ask my parents/guardians, Jessica, or my teacher.

Your name:

_____

Signed by you (or parent/guardian on behalf of you):

_____

Parent/guardian signature:

_____Date: _____

Appendix N

Children's Fear Survey Schedule - Dental Subscale for girls

Name: _____

Age:_____

Please circle how you feel about the items below. A score of 1 means you are not afraid at all, to a score of 5 means you are very afraid. There are faces below each number to help you decide how you feel. In Part 2, if you have never experienced the situation, please circle Not Applicable.

Part 1:

1. How do you feel about going to the dentist?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

2. How do you feel when you see the dentist in a blue uniform?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

3. How do you feel about having to open your mouth for the dentist?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

4. How do you feel about having the dentist examine your teeth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

5. How do you feel about having the dentist touch your mouth and teeth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

6. How do you feel about the dentist being so close to you and looking at your mouth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

7. How do you feel about having the dentist put instruments in your mouth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

8. When you open your mouth for the dentist, are you afraid of choking?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

9. How do you feel when the dentist cleans your teeth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

10. How do you feel about going to the doctor?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

11. If you were sick, how do you feel about having to go to the hospital?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

Part 2:

12. How do you feel about the dentist giving you an injection?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

Not Applicable

13. How do you feel when you see the dentist's drill?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

Not Applicable

14. How do you feel when the dentist is drilling your teeth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

Not Applicable

15. How do you feel about the noise of the dentist drilling your teeth?

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

Not Applicable

(Adapted from Cuthbert & Melamed, 1982)

Appendix O

Services Form. *Details have been removed about the individual clinics for privacy reasons.*

Services in Christchurch for Children with Dental Anxiety

The information below outlines some services currently available in Christchurch that can assist children with dental anxiety. If you are interested in finding such a service, please see the list below. Please be aware that the agencies vary in terms of treatment available and costing. Contact details are provided if you would like to find out more.

The [redacted] Centre

The [redacted] Centre is a free service available to children and their whanau/families. They offer assessments and interventions on a short-term basis for whanau/families who are not receiving support from other services. Registered psychologists operate the clinic. The staff have experience treating children with anxiety and phobias.

Contact details:

Email:

Phone:

The [redacted] Centre

The [redacted] Centre is able to provide psychological services, including assessments and treatments for children. The staff at the [redacted] Centre are experienced clinical psychologists. The services they provide are extensive, and include help with traumatic events, anxiety and stress.

Contact details:

Email:

Phone:

[redacted] – Private Services

[redacted] is a clinical psychologist. She provides private services outside the Centre and welcomes new clients. She has many years experience working with children and their whanau/family, as well as specific experience working with children with anxiety.

Contact details:

Phone:

[redacted] – Private Services

[redacted] is a clinical psychologist. She has experience working with children and families in areas such as, family court, anxiety, trauma, family stress, and learning difficulties.

She is available for consultations on Wednesdays, Thursday, and Fridays from 9am to 5pm. She is happy to see new clients and can normally arrange an appointment within 2 weeks from initial contact.

Contact details:

Email:

Phone:

[redacted] – Private Services

[redacted] is a clinical psychologist and provides private sessions for children and whanau/families. She is happy to see new clients. She charges $150 per 50-minute session and is available from 13 July 2015.

Contact details:

Email:

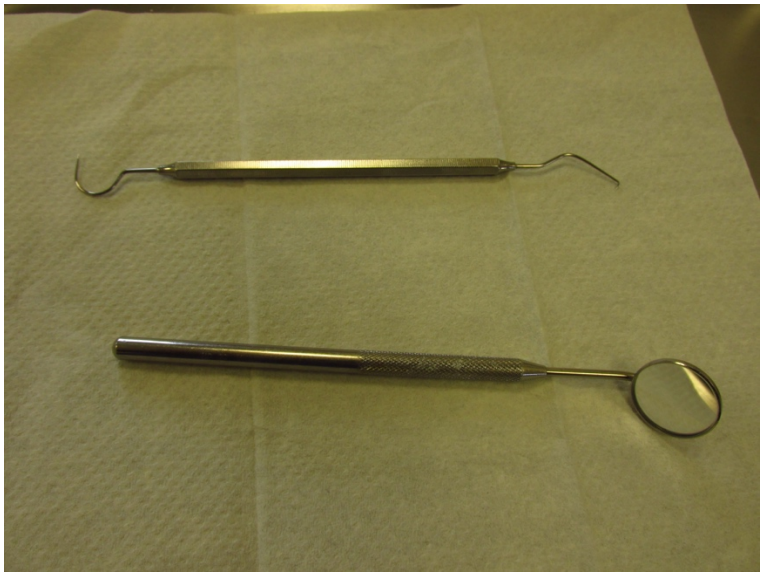
Phone:

Appendix P

Male cartoon faces for responses to Children's Fear Survey Schedule - Dental Subscale for boys and Behavioural Avoidance Test for boys

Appendix Q

Behavioural Avoidance Test Images



Appendix R

Behavioural Avoidance Test

Name: _____

Age:_____ Class:_____

1. Dental chair

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

2. Mirror and explorer

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

3. Drills

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

4. Suction

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid

5. Dentist

1	2	3	4	5
Not afraid at all	A little afraid	Somewhat afraid	Pretty much afraid	Very afraid